PATTERNS OF PHYSICIAN PARTICIPATION IN A CHANGING HEALTH CARE MARKET: IMPLICATIONS FOR MEDICARE AND MEDICAID

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Patterns of Physician Participation in a Changing Health Care Market: Implications for Medicare and Medicaid

by

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Dissertation

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Abstract

Research Objective: To investigate correlates of physician participation in managed care, Medicare, and Medicaid, individually and across sectors.

Methods: The data come from the American Medical Association's 1994 Socioeconomic Monitoring Survey. Two-stage multivariate analyses were used to analyze the market, practice, and physician characteristics associated with participation in each sector, and the extent of that participation. Participation is defined as the provision of services to patients who are insured by that sector. Polytomous logistic regression was used to analyze the intersection of participation in managed care and the public-sector programs.

Results: Relative price and market demand variables generally have a positive relationship with participation in each sector. General/family practioners, pediatricians, and obstetrician-gynecologists have greater participation in managed care than physicians in other specialties. Board-certified physicians, and those in large or multi-specialty group practices are also more likely to participate in managed care. More experienced physicians and those with a greater percent of uninsured patients in their practice are less likely to do so. In looking at the intersection of managed care and Medicare, physicians in rural areas are more likely to have Medicare patients, but less likely to have managed care contracts. More experienced physicians have larger Medicare patient loads, but are less likely to participate in managed care. Analyses of the intersection of managed care

and Medicaid raise show that physicians employed by hospitals, local governments, and other institutional providers have low rates of participation in managed care and high rates of participation in Medicaid.

Conclusions: While market variables account for some of the variability in physician participation with managed care, individual characteristics of the physician and his/her practice are also significant. While this study cannot determine whether these differences are due to physician choice or MCO selection criteria, it suggests that further investigation into the "fairness of the playing field" is warranted. Findings regarding the intersection of managed care and Medicare suggest that access to specialists and access to care in rural areas should be monitored for Medicare managed care enrollees. In addition, continuity of care may be threatened as more experienced physicians are less likely to participate in managed care. Under Medicaid managed care, special attention should be paid to ensuring a role for traditional Medicaid providers.

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Chapter 1. Introduction and Specific Aims

The health care system is undergoing dramatic changes, in part motivated by the recent growth in managed care. This shift in the way health care is organized and paid for is impacting physicians as well as their patients. Despite the considerable attention given to managed care and its consequences, there has been little analysis of the characteristics of physicians who accept managed care contracts and capitation payments. Even less is known about how — or if — physicians who participate in managed care differ from those who do not with regard to their involvement in other sectors of the health care market, such as the Medicare and Medicaid programs.

For the purposes of this research, managed care is defined broadly to include health maintenance organizations (HMOs), independent practice associations (IPAs,) and preferred provider organizations (PPOs), but not indemnity plans with limited utilization review (see Chapter 2 for a discussion of various types of managed care). Participation is defined as the provisions of services to patients covered by a particular insurer. Two measures of participation are used: absolute participation (yes/no) and the extent of participation (a continuous measure).

The market for physician services among the insured general public, excluding the military, may be split into four broad categories according to the type of insurer: private indemnity insurers, private managed care plans, the Medicare program, and the Medicaid program. For those with private indemnity coverage, whether for profit or not-

for-profit, insurance companies generally cover all physician services, as long as the physician is licensed; thus, physician participation with indemnity insurers is not generally an issue. For consumers covered by each of the other types of insurers, however, physician participation — or the lack thereof — impacts consumer choice and quality of care.

Critics of managed care and consumer groups repeatedly raise concerns over physician choice and access to specialists for health plan enrollees. The underlying assumption behind the savings realized by many managed care organizations (MCOs) — that physicians may not adequately control utilization — also raises concerns about the limits MCOs place on physicians, beginning with the MCO's criteria for selecting physicians to be part of their plan. This tension between consumer choice and MCOs' need to managed care in order to control costs has been a central focus of policy debates over regulating managed care (Blendon 1998; Moran 1997; Davis, et. al. 1994). This issue has dominated Congressional debates over a "patients' bill of rights."

Physicians themselves are very concerned by the exclusive nature of many MCO panels. Some physicians view MCOs as a constraint on their access to patients, and a potential source of discrimination against certain classes of physicians (Lavizzo-Mourey, et. al. 1996). In addition, MCO selection criteria are not always transparent, and physicians can sometimes be deselected from a panel without explanation. In addition, physicians are often prohibited from discussing the details of their contracts through

nondisclosure clauses (Woolhandler and Himmelstein 1995). Concerns over the fairness of MCO physician selection and contracting procedures have been voiced through appeals for "any-willing-provider" legislation, which would force an MCO to accept on its panel any physician who wants to contract with it. While implementation of any-willing-provider legislation has been limited, some states have passed due process legislation, providing some protections for physicians, such as written notification of reasons for deselection and procedures for appealing contract terminations (Miller 1997; Marsteller, et. al. 1997; Ohsfeldt, et. al. 1998).

While managed care organizations engage in selective contracting with physicians, the public sector programs have traditionally sought to broaden the pool of physicians serving beneficiaries. Ensuring physician participation in the Medicare program has been a central concern of policy makers since passage of the Medicare law in 1965. The original design of Medicare physician payment systems mimicked the fee-for-service modality then prominent in the private sector. By paying physicians "customary, prevailing, and reasonable fees," the program matched rates in the private sector. This payment structure appeased organized medicine, which feared undue government regulation of the health care sector, and ensured physician participation in the program (Iglehart 1992a; Davis, et. al. 1990).

The dramatic increase in Medicare costs in the late 1960s through the 1980s, however, led to reforms in physician payment in 1989 (changes in hospital payment were enacted earlier). These reforms were intended to impose tighter controls on outlays for

physician services and standardize physician payments by adopting a fee schedule based on the estimated resources need to provide specific services. The legislation also sought to correct perceived imbalances in payments for different types of physicians and services. Fees for generalists and family practioners would rise relative to those for specialists; payments for patient evaluation and management services would increase in comparison to those for procedures; and fees for rural physicians would be more in line with those in urban areas. A consistent concern of those planning and criticizing those reforms was ensuring physician participation under the new payment scheme, particularly those physicians who were expected to face decreased payments (Iglehart 1992a; Iglehart 1991).

As with the Medicare program, the Medicaid program was originally designed to mimic the prevailing fee-for-service payment modality at a level sufficient to ensure physician participation. A central goal was to place beneficiaries in the mainstream of medicine, with access to the same physicians and hospitals as consumers with private indemnity coverage (Davis, et. al. 1990; Iglehart 1993). However, limited funding for the state-run Medicaid programs and escalating costs led to gaps between Medicaid fees and Medicare/private sector reimbursements beginning in the early 1970s. Consequently, low rates of physician participation in the Medicaid program have long been a problem for policy makers and beneficiaries (Sloan, et. al. 1978; Iglehart 1993).

The original design of the public sector health insurance programs suggests that, from a policy perspective, the ideal is to have all physicians participate in all sectors of

the health care market. By contrast, participation of all physicians in all health plans runs counter to the managed care industry's claim that putting constraints on the provider sector will lead to decreased costs. An individual MCO will not want to sign up all physicians in a market, thereby losing one of its primary controls over costs. Do these differences in the objectives of managed care organizations versus the public sector programs results in differences in the types of physicians that participate in each sector? If there are differences across sectors, what do they say about increasing use of managed care in the Medicare and Medicaid programs?

The goal of this analysis is to investigate physician participation with three of the four types of insurers — managed care, Medicare, and Medicaid — both individually and across sectors. Three broad issues are addressed. What are the characteristics of physicians who do and do not participate in managed care? Are these the same factors that influence physicians' decisions regarding participation in Medicare and Medicaid? To what extent is there an overlap of participation across sectors, and how do different factors explain these patterns of participation?

A number of questions arise regarding physician participation in managed care. Do physicians who participate in managed care plans and those who do not tend to differ by age, gender or specialty? What are the influences of market characteristics, such as managed care enrollment and physician supply, on managed care contracting? Are these the same attributes of physicians and market influences associated with physicians' decisions regarding participation in the Medicare and Medicaid programs?

As the Medicare program moves more beneficiaries into managed care, it will be important to know which physicians are most likely to participate in managed care arrangements. The mix of physicians in Medicare managed care could have important implications for beneficiaries regarding the continuity of care and access to specialists. Will older physicians with long-standing relationships to the elderly participate in Medicare managed care? Are the specialties most attracted to managed care the same as those most in need for treating the elderly, such as oncologists, cardiologists, and gerontologists? Conversely, for Medicare beneficiaries who chose to remain in the fee-for-service program, what are the attributes of physicians who will remain primarily in the fee-for-service sector?

Similar kinds of questions may be asked for the Medicaid program. A long-term issue for the Medicaid program has been low physician participation, primarily due to low payment rates. Will this trend continue in managed care programs? How might the profile of physicians that serve the Medicaid population change as more states move to managed care for that program? Will those physicians that have traditionally served the Medicaid program, such as those in community health centers and hospital outpatient departments be able to join or form managed care organizations? The largest share of the Medicaid population and that segment most likely to be in managed care are women and children. Are the specialists needed to treat them, such as pediatricians and obstetrician-gynecologists, adequately represented among physicians who participate in managed care arrangements?

Finally, when we look at physician participation across sectors, what kind of typology emerges? Do all physicians participate in all sectors? Or are there some that focus on treating a particular group? What are the characteristics of physicians, their practices, and their markets who fall into different categories? The answers to these questions can shed light on physician responses to the changing health care market and inform debates over questions of equity and access for both physicians and patients.

Specific aims

To address these questions, this study explores the market, practice, and individual characteristics of physicians associated with (i) participation in managed care, capitation arrangements, Medicare, and Medicaid; (ii) the intersection of participation in managed care and Medicare and the intersection of participation in managed care and Medicaid; and (iii) patterns of physician participation across all three sectors. The analysis uses physician-level data from the Socioeconomic Monitoring Survey (SMS) conducted by the American Medical Association (AMA) in 1994 and published as the Socioeconomic Characteristics of Medical Practice 1995 (Gonzalez 1995). The SMS is a nationally-representative, annual survey that collects information on the socioeconomic characteristics of physicians (regardless of AMA membership), such as income, practice arrangements, managed care contracting, and volume of services.

The specific aims of the study include:

Specific Aim 1

To develop a model of physician participation that can be applied to participation with various insurers. The market for physician services can be split into four sectors by the type of insurer: indemnity insurers, managed care organizations, Medicare, and Medicaid. In general, physicians choose which sectors to participate in, given the existing constraints of their market. It is hypothesized that choices regarding participation are influenced by market conditions, the size and type of practice the physician is a part of, and aspects of the physician's training and personal beliefs. The model will build on economic models of physician behavior, supplemented by empirical results from health services research.

Specific Aim 2

To apply the model to physician participation with managed care and capitation arrangements, Medicare, and Medicaid.

- Existing survey data has described bivariate relationships between certain physician and practice characteristics and managed care contracting, the percent of revenues from managed care, acceptance of capitation arrangements, and the proportion of a physician's managed care revenues that are capitated. This study goes beyond those analyses to: (i) adopt a multivariate approach that can assess the impact of each characteristic while holding the others constant; and (ii) introduce market variables, such as managed care penetration and physician supply, into the analysis.

- The same types of physician, practice, and market characteristics will be used to analyze participation in the Medicare and Medicaid programs, and the percent of patients derived from each of these programs. In addition to providing information on which physicians are most involved in these programs, this analysis will allow a comparison of the attributes of physicians who are involved in managed care with those who participate in Medicare and Medicaid.

Specific Aim 3

To analyze the relationships between participation in public sector programs and managed care contracting, controlling for other physician characteristics. More beneficiaries of public sector programs are choosing, or being forced to join, managed care plans. As this happens, it is important to understand whether or not the physicians who are most likely to be involved in managed care are the same as the physicians who have historically served the Medicare and Medicaid populations. In addition, understanding the relationship between involvement in these programs and the likelihood of contracting with managed care organizations will inform policy decisions regarding the use of managed care in these public sector programs.

Specific Aim 4

To develop a classification scheme for physicians based on their participation with managed care, Medicare, and Medicaid and analyze the characteristics of physicians who fall into each category. The public sector programs were originally designed to

ensure participation by the majority of physicians, suggesting that all physicians should be involved in all sectors of the health care market. By looking at the distribution of physicians vis-à-vis their participation in various sectors of the market, we can see if this ideal has been achieved in practice. The analysis will also indicate whether or not there are systematic differences among physicians with different patterns of participation.

Significance

In the mid-1990s, the health care market was transforming from one based primarily on indemnity insurance to one where managed care organizations dominated the private insurance market. The year of the survey used in this analysis (1993/1994) marks a transition period, where managed care was prevalent but not overwhelmingly dominant. In 1993, 51 percent of those with employment-based heath coverage were in managed care plans (Eisenberg 1994b). The Medicaid program enrolled about 15 percent of beneficiaries in managed care in 1993 (Iglehart 1999), while only 5 percent of Medicare beneficiaries were in managed care plans (HCFA 1997). This situation allows for variations in physician involvement in managed care that may shed light on why physicians choose to join or not join MCO plans. Understanding why physicians choose to participate in managed care — and the extent of their involvement with managed care — will elucidate future policy regarding managed care. Differences in participation with managed care will provide evidence of differences in involvement with MCOs among specific groups of providers. This will inform the debate over the "fairness of the playing field" for physicians in a managed care market, as has been discussed in the debate over any willing provider legislation. These results will also show differences in

participation by specialty, which is one element of the debate over patients' access to care in managed care plans, an issue that is central to discussions over a "patients' bill of rights." Looking across participation in managed care and the public sector programs will highlight factors that have a differential relationship to participation in managed care as opposed to Medicare and/or Medicaid. These findings could highlight access and quality issues to be addressed as these programs increase their reliance on managed care Finally, applying a model of participation across sectors expands our knowledge of how physicians are reacting to changes in the health sector, and adds to the body of research on physician behavior.

Chapter 2. Literature Review

This chapter first reviews salient findings from the literature regarding the development of insurance markets and the growth of managed care in the United States. Then, evidence regarding physician participation with managed care, capitation, Medicare, and Medicaid is discussed. Finally, economic models of physician behavior, and their extension to physician participation, are discussed.

Development of insurance markets

Although prepaid health care plans have existed in the United States since the last century (Friedman 1996), the dominant form of physician payment has historically been fee-for-service to independent physicians working in solo or small-group practices. That is, physicians would charge a specific amount for rendering a service, such as examining a sick patient. Before widespread insurance coverage for physician services, patients generally paid physicians directly. The amount of payment usually depended on both the physicians' charges and the patients' ability to pay.

The first broad-scale insurance programs in the United States emerged in the early 1930s as group coverage for hospital expenses. These plans, which were encouraged by the American Hospital Association as a means to ensure the financial solvency of the industry, and controlled by the medical profession, became known as Blue Cross plans. Plans offering insurance coverage for physician services began later in the decade,

starting with the Blue Shield plans, which were also controlled by physicians (Starr 1982; Iglehart 1992b).

Health insurance in the private sector expanded in the 1940s and 1950s, fueled in part by the provision of health insurance as a fringe benefit to employees during World War II, when wage increases were restricted. After the war, employers continued to offer health insurance to employees and their dependents. The government encouraged inclusion of health insurance as a benefit by designating these benefits as tax-exempt.

As health insurance became widespread, organized medicine worked through political channels to ensure that indemnity coverage and fee-for-service payment remained dominant. The medical profession was interested in maintaining a fee-for-service payment system to ensure physicians' continued control over the prices charged for their services (Starr 1982). This type of payment system, however, leaves few mechanisms for controlling the total costs of physician services. Individual consumers, who might be expected to discipline the market through cost-conscious selection of providers, have little incentive to do so, given that their out-of-pocket costs are limited under insurance policies with first-dollar coverage or low deductibles. In addition, this payment mechanism rewards physicians for providing additional services, potentially leading to excessive or unnecessary care (Feldstein 1988).

In the 1960s, the Great Society programs of Kennedy and Johnson called for an end to poverty, including an extension of medical coverage to the most vulnerable.

Compromises between those who wanted a broader, national insurance program and the medical establishment led to categorical public sector programs targeting the elderly (Medicare) and the poor (Medicaid). Again, the medical establishment fought to minimize government control over the practice of medicine and to maintain a fee-for-service system of payment (Starr 1982).

During this century, prepaid health plans, the precursors of managed care, developed slowly. What came to be known as health maintenance organizations (HMOs) began as collective, nonprofit endeavors, often established to ensure health care for populations not served by private medicine. The HMO Act of 1973 provided a loan and grant program to encourage the development of more HMOs and established a limited regulatory framework for their operation. The continuous growth of health care costs in the 1970s and early 1980s fueled private sector initiatives to adopt more cost-conscious approaches to paying for physician services, generically termed managed care (Stoline and Weiner 1993; Iglehart 1994; Friedman 1996).

Today, the source of health insurance for most Americans continues to be either an employer or the public sector programs. In 1997, Medicare covered 38.4 million people and Medicaid provided insurance for 41.3 million people (Levit, et. al. 1998), while 167.7 million citizens had private health insurance, mostly from employment-based plans (EBRI 1999). Of those with private coverage, 75 percent are in some form of managed care (Iglehart 1999c). The Census Bureau estimates that 43.4 million Americans (16.1 percent) were uninsured in 1997 (Bennefield 1998). In 1997, the

breakdown of health expenditures for each sector was: $214 billion for Medicare; $160 billion in state and federal funds for Medicaid; and $348 billion for private insurance premiums, including both indemnity and managed care plans (other sources of private spending include out-of-pocket payments and other private spending) (Levit, et. al. 1998).

Growth of managed care

Managed care organizations (MCOs) include many different organizational structures, including staff/group model Health Maintenance Organizations (HMOs), Independent Practice Associations (IPA)/Network model HMOs, Preferred Provider Organizations (PPOs), and Point of Service (POS) plans. All of these organizations are integrated systems that agree to manage services for an enrolled population, either in their own facilities or through a network of contracts with providers. Enrollees are generally limited to the providers in the plan, or are subject to larger deductibles and copayments for services obtained from providers outside the plan. To varying degrees, managed care organizations also all rely on utilization management tools to review the care received by their enrollees in an effort to control costs. Despite the variation in types of MCOs, this analysis focuses on managed care in a broad sense, including IPAs and PPOs, as well as the more traditional staff- and group-model HMOs.

The growth of managed care has been especially strong in the 1990s. By 1995, managed care organizations provided health services for more than 100 million Americans (Wolf and Gorman 1996). Today, managed care is the predominant type of

insurance for individuals who have health care coverage provided through employers; in 1997, 85 percent of those with employer-sponsored coverage were in some sort of managed care plan (Levit, et. al. 1998).

Much of the recent growth in managed care has taken place in POS plans, which allow for greater enrollee choice of provider, and in IPA plans, which have been growing in response to physician mobilization for access to patients and freedom to remain in solo, small group, and large-group practices. PPOs have also increased their market share considerably, with more than 60 million enrollees in 1995 (Wolf and Gorman 1996). The managed care market is also characterized by growth in the for-profit sector, with increased consolidation and vertical and horizontal integration of managed care organizations.

States have been rapidly increasing the enrollment of Medicaid recipients into managed care arrangements. About one-third of beneficiaries were enrolled in managed care in 1995, up from 15 percent in 1993 (HCFA 1997). By 1997, the number was 40 percent, over 15 million people (Kaiser Family Foundation). Enrollment of Medicare beneficiaries in managed care plans grew more slowly. In 1993, approximately 5 percent of the elderly were in Medicare managed care plans. By 1995, about 11 percent of Medicare beneficiaries were in managed care (Wolf and Gorman 1996). In 1997, the figure was 13 percent, or 5 million people (ProPAC 1997). Managed care in the public sector programs will be discussed more fully below.

Participation with managed care

The results of physician surveys regarding participation in managed care are discussed below and summarized in Table 1. The analysis presented here uses the survey results published in the 1995 Socioeconomic Monitoring Survey, which was conducted in 1994. This data was first made available to researchers outside the AMA in 1997 and was the most recent year of data available when the research was begun. Other surveys from the mid-1990s are also included in Table 2.1, and discussed here as a comparison to the data used for the analysis.

Among the full sample of physicians in the 1995 SMS (conducted in 1994), 77 percent of physicians had managed care contracts. By type of managed care organization, the survey indicated that 55 percent of physicians participated in PPOs, 32 percent in IPAs, and 55 percent in non-IPA model HMOs (Emmons and Simons 1995). A 1994 survey of physicians sponsored by the Physician Payment Review Commission (PPRC) indicated that physicians tend to contract with multiple managed care plans, in addition to maintaining fee-for-service patients. Of the approximately 2,000 physicians surveyed, about 72 percent had a PPO contract and about 50 percent participated in either a capitated plan or a fee-for-service contract that incorporated a withhold (Project HOPE 1995). A 1996 survey sponsored by the trade journal Medical Economics found that 77 percent of physicians participated in HMOs and 75 percent participated in PPOs (Medical Economics 1996a). The generalizability of this survey is limited by its very low response rate of 19 percent (Medical Economics 1996b). The AMA's 1996 SMS (conducted in

1995) indicates that in 1995, 83 percent of physicians had some sort of managed care contract, 6 percent more than in the previous year (Emmons and Simons 1996).

In the surveys from the mid-1990s, managed care participation was more likely for generalists than specialists. It was also more common in the West, upper Midwest, and New England than in the South and mid-Atlantic regions. Physicians in larger practices were more likely to participate in managed care contracts than those in solo or small group practices.

While the percentage of physicians in practices that contract with managed care organizations was quite high in the mid-1990s, the percentage of practice revenues coming from managed care organizations was lower. In the 1996 Medical Economics survey, physicians with HMO contracts reported 20 percent of gross income coming from those contracts, while those with PPO contracts derived 15 percent of gross income from them. The 1995 and 1996 AMA SMS surveys provided similar numbers. In the 1995 SMS (conducted in 1994), physicians with managed care contracts derived 34 percent of all revenues from managed care; in the 1996 survey (conducted in 1995), the figure was 33 percent. Within contract types, the 1996 SMS showed that those with HMO contracts received 20 percent of their revenues from HMOs, PPO contractors received 18 percent of revenues from PPOs, and IPA contract holders derived 11 percent from IPAs. These figures indicate that while most physicians contracted with managed care plans in mid-1990s, their extent of involvement with them was limited. The trends by specialty, region, and practice size mirrored those for managed care participation more generally.

The AMA's most recent survey, the 1997/1998 SMS (conducted in 1997), found that 92 percent of physicians are in a practice with at least one managed care contract (Kane, et. al. 1998). Psychiatrists were least likely to have contracts (81 percent); anesthesiologists were most likely (98 percent). By practice size, solo physicians were less likely than those practicing in groups to have contracts. Few variations in the binary (yes/no) measure of contracting were apparent by region, with averages ranging from 91 to 94 percent. The widespread nature of managed care contracting in the latest AMA SMS survey suggests that one of the measures used in this analysis — whether or not the physician has a managed care contract — may need to be revised in analyses of data from later years. A focus on the extent of involvement with managed care may be more relevant for later periods. This issue will be revisited in Chapter 7.

By the 1997/98 survey (conducted in 1997), physicians with managed care contracts derived, on average, 49 percent of revenues from managed care (Kane, et. al 1998). Differences were seen by specialty: obstetrician/gynecologists had the largest managed care revenue share (62 percent), followed by pediatricians (60 percent). Pathologists reported the lowest percent of revenues from managed care (37 percent). Other specialties reported revenues shares ranging from 45 to 50 percent. By region, managed care revenue shares were greatest in the Pacific region (55 percent) and New England (53 percent), and lowest in the South Atlantic (44 percent).

Table 2.1 Summary of Survey Results Regarding Managed Care Contracting

Survey	*% with managed care contract(s)*	*% revenues from managed care*[a]	*% with capitated contract(s)*	*% of revenues from capitation*[b]
PPRC 1994	72 PPO	—	50[c]	—
Medical Economics 1996	77 HMOs 75 PPOs	20 HMOs[d] 15 PPOs[d]	38	15[d]
AMA SMS 1995 (conducted 1994)	77 Overall 55 HMO 65 PPO 32 IPA	34 Overall 21 HMO 19 PPO 13 IPA	26[e]	18[e]
AMA SMS 1996 (conducted 1995)	83 Overall 64 HMO 69 PPO 39 IPA	33 Overall 20 HMO 18 PPO 11 IPA	33	19
AMA SMS 1997/98 (conducted 1997)	92 Overall	49 Overall	36	23

[a] Among those with managed care contracts of the specified type.
[b] Among those with capitated contracts.
[c] Also includes fee-for-service contracts that incorporate withholds.
[d] Percent of Gross Income
[e] Calculated from dataset

Experience with capitation falls far behind managed care contracting. In the Medical Economics survey, 38 percent of physicians had capitated contracts and obtained 15 percent of gross income from them. The AMA SMS surveys indicate a slow spread of capitation in the 1990s. In the 1995 SMS (conducted in 1994), 26 percent of physicians had a capitated contract, deriving 18 percent of revenues from them. In the 1996 SMS (conducted in 1995), 33 percent of physicians worked in a practice with a capitated contract, deriving 19 percent of revenues from them (Emmons and Simon 1996). By the 1997/98 survey (conducted in 1997), the numbers had increased only moderately, with 36 percent of physicians having a capitated managed care contract. Those physicians obtained an average of 23 percent of revenues from capitated contracts. A further analysis of the 1996 SMS (Simon and Emmons 1997) indicated considerable variation in

acceptance of capitation. Capitation is most likely in New England, followed by the Pacific and Mountain regions. Southern states had less capitation. As might be expected, primary care physicians were more likely to accept capitation, as were physicians in larger practices. The trends for the percent of capitation by specialty, region, and practice size followed those for acceptance of capitated contracts.

The survey results shown above provide a snapshot of physician involvement with managed care and capitation arrangements. However, they do not provide a detailed analysis of the factors motivating participation. An important set of factors not analyzed in descriptive studies is the role of market-level forces as key determinants of managed care participation. Do the effects noted above persist after controlling for HMO market penetration? What is the impact of other market forces, such as payment rates and competition among physicians, on participation rates with managed care? Are physicians in areas with a high number of physicians per capita more likely to contract with managed care as a way to maintain their patient base? Furthermore, bivariate analyses, such as those presented above, may mask the true relationship between one characteristic and managed care contracting because of the confounding influence of a third factor. Multivariate analysis is necessary to disentangle these relationships.

Participation with Medicare

To ensure the cooperation of the medical establishment with the Medicare program, the government agreed to a fee-for-service payment system, administered by private intermediary organizations, rather than by the government itself (Starr 1982). The

Medicare program began paying physicians based on customary, prevailing, and reasonable (CPR) charges. This "comparison" approach paid physicians according to their charges, as long as they exceeded neither the physician's customary charge for that service (the median charge for the previous year), nor the prevailing charge in the physician's market (the 75th percentile of customary charges). This payment mechanism allowed for great disparity in the payments received by physicians by specialty and by geographic region. It also caused considerable inflation in physician payments. A charge that was not reimbursed in full because it exceeded the customary or prevailing charge for that year was nevertheless included in the calculation of the next year's customary and prevailing charges (Ginsburg and Lee 1991).

Payment reforms

Given dramatic rises in expenditures on physician services in the 1970s and 1980s, physician payment reforms to the Medicare program began in the mid-1980s, following reforms in the hospital sector. First, a system of participating physicians similar to that of the Blue Shield plans was developed. Then, a broader set of reforms were put in place when Congress instituted the Medicare Fee Schedule (MFS) under the 1989 Omnibus Reconciliation Act (OBRA '89). The Health Care Financing Administration (HCFA) phased in the fee schedule between 1992 and 1996.

The OBRA '89 legislation brought about a number of changes in Medicare's policies; only those directly related to physician payment are discussed below. Using a resource-based-relative-value-scale (RBRVS) to set rates, the Medicare Fee Schedule

(MFS) pays physicians for the resources needed to perform a service, including the physician's work, practice costs, and malpractice insurance. Originally, practice cost and malpractice expenses were derived from the historically charged rates. However, HCFA has begun phasing in a resource-based approach to determining practices costs, and plans to begin treating malpractice costs this way on January 1, 2000 (MedPAC 1999). By basing the fee schedule on physician work, the RBRVS increases payments for evaluation and management while decreasing payments for procedures. This effectively decreases the gap in fees paid to specialists versus primary care physicians. The base unit (relative value unit) is then adjusted for geographical differences in costs and converted into dollars. Relative value units, adjustment rates, and the dollar conversion factor are updated on an annual basis.

To control for volume offsets by physicians and to constrain overall costs for physician services under Medicare, the legislation also called for a Volume Performance Standard (VPS). Under this provision, Congress sets an annual target rate of increase for physician expenditures. If Congress does not approve specific targets, a default formula is used. If this rate is exceeded, increases in fees for a future period will be reduced. There is a two-year lag between the year in which expenditures are incurred and the year in which fee reductions take place. In addition to changes in the mechanism for determining physician payment levels, OBRA '89 introduced limits on physicians' ability to bill patients directly for charges in excess of the Medicare allowable charge. The balance billing limits were originally set at 15 percent of the allowable charge. The next

section presents evidence concerning the impact of the MFS on physician participation and beneficiary access to care.

Research results

As noted above, HCFA phased in the Medicare Fee Schedule (MFS) from 1992 to 1996. Evidence of the effects of the MFS is limited, given the recent implementation of this program, but suggests that the federal government has exerted some control over cost increases. Specifically, Medicare's payments to physicians increased more slowly than those of the private sector in every year from 1988 to 1993 (ProPAC 1995). Most research on the MFS has focused on two areas.

First, studies have assessed the consequences of the MFS on access to care for Medicare beneficiaries, responding to concerns that physicians will take fewer Medicare patients because of the lower fees introduced in the MFS. The PPRC, and later MedPAC, have tracked the comparison of Medicare fees to private sector fees. In 1996, Medicare fees were estimated to be about 71 percent of those in the private sector (PPRC 1996). These concerns appear to be unwarranted (Colby, et. al. 1995; Eisenberg 1994; Lee and Gillis 1994; Lee and Gillis 1993; Gillis, et. al. 1992; Gold, et. al. 1993).

Second, analyses by the HCFA, PPRC, and others have looked at the effect of the MFS on physician revenues and incomes by specialty, particularly the extent to which it has achieved its objective of narrowing the gap in Medicare payments for evaluative and management services versus procedures (Hsiao, et. al. 1992; Hsiao, et. al. 1993). It

appears that this gap has narrowed somewhat, but not to the extent originally intended (PPRC 1996).

In addition to the research on the impact of the MFS, Damiano, et. al. (1997) looked at primary care physician participation with the Medicare program more generally. Their study of physicians in Iowa looked at two outcomes: whether or not the physician was accepting new Medicare patients, and the percent of Medicare beneficiaries in the physician's practice. They found that both economic and noneconomic issues explained variation in participation rates. Specifically, the level of demand, as measured by the number of Medicare beneficiaries in the county, was positively associated with both acceptance of new Medicare patients and the percentage of Medicare patients. The number of years the physician had spent in his/her current practice also had a positive association with Medicare participation. General internal medicine physicians had more Medicare patients than family practice physicians, while obstetrician-gynecologists had fewer. Of the noneconomic factors, two — enjoyment in treating elderly patients and a belief that the Medicare program respects the physician's professional judgement — were statistically significant and positively associated with the percent of Medicare patients. Those who felt they had too many Medicare patients were less likely to be accepting new Medicare beneficiaries. Notably, questions about the physician's perceptions of Medicare fees were not statistically significant. However, the study relied on the physician's perceptions of Medicare fees versus other insurers and did not include numeric measures of relative fees.

Medicare Managed Care

Beneficiaries of the Medicare program have had the right to enroll in HMOs since the early 1970s. It was not until passage of the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA 1982), however, that Medicare created the risk-contracting program, which encouraged HMOs to take Medicare enrollees. The TEFRA legislation mandated demonstration programs, followed by full-scale implementation in 1985 (Clement, et. al. 1995). By April 1997, more than 5 million beneficiaries — 13 percent — were enrolled in managed care plans (ProPAC 1997).

The growth in managed care enrollment by Medicare beneficiaries has been the subject of considerable research. One important vein of study has been to assess the extent to which favorable selection is occurring in Medicare managed care (Brown, et. al. 1993, Dowd, et. al. 1994, Morgan, et. al. 1997). Favorable selection occurs when managed care enrollees are healthier as a group than those who are in the fee-for-service sector, either as a consequence of beneficiary choice, or managed care plan efforts. Risk selection has financial implications for the Medicare program. The risk-contract program pays HMOs based on the costs of Medicare beneficiaries in the fee-for-service sector. If, as studies have indicated, the risk-contract enrollees are, on average, healthier than the fee-for-service beneficiaries, then this type of payment formula could result in over-payment to the risk-contract HMOs. A related set of studies has looked at ways to counter risk selection through adjustment to capitation payments, or other payment mechanisms (Newhouse, et. al. 1997; Ellis, et. al. 1996; Weiner, et. al. 1996). Other researchers have looked at the utilization (Brown, et. al. 1993) and outcomes of care (Clement, et. al. 1994,

Miller and Luft 1994; Miller and Luft 1997) for Medicare managed care beneficiaries, as well as patient satisfaction (Brown, et. al. 1993; Rubin, et. al. 1993; Davis, et. al. 1995).

Despite this sizable body of research, few studies have focused on the attributes of the physicians involved in Medicare managed care, or how the attributes of physicians participating in the Medicare program compare to those of physicians that contract with managed care organizations. The AMA's 1997/1998 SMS (conducted in 1997) reported national estimates of physician participation in Medicare managed care plans for the first time. Of the survey physicians, 58 percent had at least one Medicare managed care contract. On average, physicians with a Medicare managed care contract reported receiving 16 percent of their revenues from them.

Current trends project higher rates of managed care for the Medicare program. The Congressional Budget Office projects that almost 30 percent of beneficiaries will be enrolled in managed care by the year 2005 (Lamphere, et. al. 1996). In addition, the Balanced Budget Act of 1997 took steps that will lead to more, different types of managed care through adoption of the Medicare+Choice Program, which allows PPOs and provider-sponsored organizations to enroll Medicare beneficiaries, among other provisions (Congressional Research Service 1997). Early implementation of the Medicare+Choice, however, led to few new options for Medicare beneficiaries, and a decrease in the number of Medicare risk plans (MedPAC 1999). On July 1, 1999, a number of plans announced their intentions to leave areas where they feel payments are too low, and/or increase premiums and copayments for enrollees (Goldstein and

Hilzenrath 1999). Despite these obstacles, it seems likely that even incremental changes to the Medicare program will lead to a heavy reliance on managed care. As a consequence, it is important for the Health Care Financing Administration (HCFA) and Congress to understand which physicians are more likely to be involved in Medicare managed care, and which ones are likely to remain in the fee-for-service sector, which may be insuring more elderly, sicker, and more expensive individuals than the managed care sector. If there are systematic differences in the types of physicians that participate in Medicare managed care versus the fee-for-service program, beneficiaries' choice of provider, as well as their access to their usual source of care and/or specialists may be affected.

Participation with Medicaid

Payment policies

Historically, Medicaid programs also paid physicians on a fee-for-service basis, generally using a fee schedule. Under this federal-state partnership to provide insurance to certain categories of the poor, disabled, and poor-elderly, states determine payment rates for providers. As Medicaid expenditures increased dramatically in the 1970s and 1980s, Medicaid payment levels did not increase as rapidly as those of other insurers. Given the low payment rates, many physicians do not accept Medicaid patients, raising issues of beneficiaries' access to care and the quality of care received (Watson 1995). In a further attempt to decrease expenditures, states have sought to enroll large numbers of their Medicaid beneficiaries into managed care programs in recent years, although the

ability of managed care to realize the projected savings is unclear (Iglehart 1993; Freund and Hurley 1995; Kaiser Commission 1995). The issue of Medicaid managed care will be discussed further below.

Research results

Numerous researchers analyzed physician participation in Medicaid programs in the 1980s and 1990s. Three types of outcomes have been analyzed: absolute participation (yes/no), limited versus full participation (accepting all, some, or no new Medicaid patients), and the percent of patients that have Medicaid coverage. They generally focused on the gap between Medicaid fees and payment rates in the private insurance sector, the geographic distribution and qualifications of physicians, and the location of underserved populations.

On balance, these studies conclude that physicians are more likely to participate in Medicaid programs, or to participate fully, in states with higher payments relative to the private sector and more timely payment procedures (Sloan, et. al. 1978; Perloff, et. al., 1986, 1987, 19995; Fox, et. al. 1992; Mitchell 1991; Cykert, et. al., 1995). In addition, an increase (decrease) in fees in a given state encourages (discourages) physician participation in that state's program (Gabel and Rice 1985). However, results regarding the elasticity of physician response to fees indicate that substantial increases in fees would be required to reach full participation rates (Perloff, et. al 1995; Watson 1995). Also, in a study limiting the analysis to urban primary care physicians, the relationship between fees and participation did not hold (Perloff, et. al. 1997).

Across studies, being a graduate of a foreign medical school, being younger or having fewer years in practice, and practicing in areas with a higher proportion of Medicaid beneficiaries were positively associated with participation (Perloff, et. al. 1997, 1995, 1987, 1986; Fairbrother, et. al. 1995). Board certification, urban location, and practicing in areas with a higher per capita income were negatively associated with Medicaid participation (Perloff, et. al. 1997, 1995, 1987). Several studies found that black, hispanic, and female physicians were more likely than other physicians to serve Medicaid populations (Fairbrother, et. al. 1995; Cantor, et. al. 1996; Komaromy, et. al. 1996; Moy and Bartman 1995). Belief in a social role of medicine (Sloan, et. al. 1978; Perloff, et. al. 1987) was also positively associated with participation in Medicaid programs.

While most of the studies noted above used data from physician surveys, Gifford (1997) collected data from the beneficiary's point of view. The study methodology relied on telephone calls to physician offices in Chicago asking for information about scheduling an initial prenatal visit for a pregnant, teenaged Medicaid recipient. In this way, the researchers measured the actual willingness of a physician's practice to accept a specific new Medicaid patient, rather than the physician's hypothetical response to questions regarding acceptance of Medicaid patients in general. This approach led to a lower estimate (37 percent) of participation by obstetricians than were found in previous studies based on physician surveys.

Medicaid Managed Care

Interest in managed care for the Medicaid population first arose in the early 1980s, when a number of demonstration programs were established. The costs of the Medicaid program skyrocketed in 1980s and 1990s, as the costs of medical care escalated and the number of beneficiaries increased. In the face of these problems, managed care appeared to be a way to control costs, while possibly increasing access for the uninsured, and increasing the coordination of care received (Freund and Hurley 1995). By 1998, 48 states had some type of managed care program to serve their Medicaid populations. About 40 percent of beneficiaries — over 15 million people — were enrolled in managed care in 1997 (Kaiser Family Foundation 1998). This increased enrollment has focused on women and children; many fewer elderly and disabled Medicaid beneficiaries are enrolled in managed care (Holahan, et. al. 1998).

As with evaluations of the Medicare managed care program, research on Medicaid managed care has focused on controlling utilization and costs (Buchanan, et. al. 1996), risk selection, marketing practices, and beneficiary satisfaction. Given the recent growth in Medicaid managed care, little evidence has accumulated concerning the quality of care under Medicaid managed care, and the impacts on health outcomes (Holahan, et. al. 1998; Freund and Hurley 1995), although implementation efforts are being tracked (Holahan, et. al. 1998). Another policy concern in the Medicaid managed care arena is the ability of traditional providers, such as community health centers and outpatient departments, to join and/or form managed care practices and obtain managed care contracts (Holahan, et. al. 1998; Fairbrother, et. al. 1995; Kaiser Commission 1995).

Regarding physician participation in Medicaid managed care, a survey of 300 primary care physicians in Arizona examined participation in that state's mandatory Medicaid managed care program, the Arizona Health Care Cost Containment System (AHCCCS). The authors found that reimbursement remained a significant determinant of participation. Contrary to previous studies, however, the participating physicians were similar to those who did not participate by age, years in practice, and medical training (Silverstein and Kirkman-Liff 1995). Further analysis of the perceptions of these physicians found that they viewed Medicaid managed care and commercial managed care programs similarly, suggesting that participation in commercial managed care may be predictive of participation in Medicaid managed care programs (Silverstein 1997). Given the wide variety of approaches states have taken with the Medicaid managed care programs, these results cannot be generalized beyond Arizona. This is especially true given that AHCCCS has been in place since the early 1980s — longer than any other Medicaid managed care program.

Additional research will be required to assess physician participation in Medicaid managed care programs. The AMA's 1997/1998 SMS (conducted in 1997) reported national estimates of physician participation in Medicaid managed care plans for the first time. Of the survey physicians, 57 percent had at least one Medicaid managed care contract. On average, physicians with a Medicaid managed care contract reported receiving 12 percent of their revenues from them.

Models of physician behavior

Economic theory

The underlying question behind physicians' willingness to contract with managed care organizations, accept capitation, and participate in Medicare and Medicaid is one of physician choice. This view of physician participation assumes that physicians are the decision-makers, acting in response to the market for their services, and constrained by the forces of governmental regulation and organized medicine. It also assumes that physicians have full information about market conditions. In the short run, these conditions are fixed. However, in the long run, physicians may change market conditions and government regulations through choice of location and political pressure. Understanding the correlates of the observed choice requires a behavioral model of physicians' decisions regarding participation with different types of payers.

Economists have traditionally looked at physician behavior as an integral part of medicine as a whole. In his seminal work, "Price Discrimination in Medicine," Kessel (1958) characterized the physician as a discriminating monopolist in the market for medical services. The most important evidence of this monopoly power was the ability to control prices through a fee-for-service payment system and to undertake price discrimination. That is, physicians could charge different consumers different prices. For instance, those with insurance coverage could be charged more than those without insurance. While physicians maintain that charging those who can least afford medical care less is a manifestation of charity, Kessel argues that the concomitant ability to

charge those who can afford it much more is a manifestation of monopoly power. Kessel also cited other indications of monopoly power of medicine. Physicians and hospitals are able to place barriers to entry into the practice of medicine through control over licensing procedures and medical schools. Traditionally, physicians discouraged advertising, a hallmark of competitive markets. Finally, the AMA considered itself the voice of all physicians in the political arena and lobbied on their behalf to protect their professional and financial interests.

According to Kessel, the power of organized medicine was embodied in the AMA and state medical societies. He cited organized medicine's fierce protection of fee-for-service payment for medical care and intense opposition to the development of pre-paid health services and national health insurance as illustrations of organized medicine's attempts to maintain physicians' monopoly power. In this framework, the behavior of individual physicians was shaped and constrained by organized medicine. Those who attempted to strike out in new directions, such as establishing pre-paid clinics, were punished by losing their membership in the local medical association, which was often necessary for obtaining hospital privileges. Since access to hospital services is generally required for patient care, the threat of losing privileges acts as a strong deterrent. Those who protected the fee-for-service payment system were rewarded with positions of authority within organized medicine and through collegial systems of patient referral. Thus, through a system of rewards and punishments individual physicians were persuaded to act in ways that protected the power of medicine as an institution, even when to do so was not in their individual interest.

This view of the physician as a monopolist dominated much of the debate over access to and costs of medicine in the 1960s and 1970s, and laid the foundation for discussions over supplier-induced demand. Pauly (1980) built on Kessel's view of physician behavior in his classic work Doctors and Their Workshops: Economic Models of Physician Behavior. Pauly argued that the returns for physician effort "play a role in the medical sector which is analogous to that played by profits in the for-profit sector… [and] provides the financial incentive which determines the bulk of resource use, output quantities and characteristics, and total costs in the health sector (p. 1)." Pauly presents numerous models of physician behavior based on maximization of physician utility. He demonstrates that whether the physician is a real-income maximizing monopolist, a partially benevolent oligopolist, or a partially benevolent monopolist, standard economic models based on utility maximization are appropriate for explaining physician behavior.

Empirical models — choice theory

Developed for analyzing observed consumer choices, choice theory is an extension of random utility theory for choosing among a discrete set of alternatives. Choice theory analyzes observed choices under the assumption that individuals make these choices to maximize their utility from both monetary and non-monetary sources. The choices of the observed individuals are then considered to be representative of a group of people with similar characteristics. McFadden (1973) first developed conditional logistic regression as a statistical technique for modeling discrete-choice situations. Others have applied it to transportation, marketing, and other consumer applications (Mayer 1995).

Choice theory has been applied to health care in a number of areas. Several authors (*e.g.* Feldman, et. al. 1989, Chernew and Scanlon 1997) have modeled consumer choice of various insurance plans. Others, such as Frank and Kamlet (1989) and Fortney et. al. (1998), explored individuals' decision to seek mental health care and their choice of primary versus specialty care for mental health services. Haas-Wilson and Savoca (1990) looked at choice of provider and quality of care for vision care. Coughlin, et. al. (1990) modeled the choice of nursing care provider, while Lewin-Epstein (1991) examined determinants of individuals' regular source of health care.

Less research has been done applying choice theory to decisions made by physicians rather than consumers, but several studies have done this. In these models, physicians are faced with a number of choices. They choose among alternatives by assessing the utility of each alternative and adopting the alternative that maximizes their utility. Using the physician as the unit of analysis, a choice model has been used to explore choice of specialty (Kiker and Zeh 1998) and choice of practice mode, such as solo versus group practice (Goodman and Wolinsky 1982; Freshnock and Goodman 1980). Steinwald (1983) explored payment methods for hospital-based physicians using physicians as the unit of analysis.

In a study more directly relevant to this analysis, Sloan, et. al. (1978) developed an empirical model for analyzing physician participation in Medicaid based on the theory of a two-market model that extends from utility maximization theory. (The authors noted that this model could be extended to other sectors of the market.) In this

conceptualization, physicians are faced with a fee-for-service sector, in which they set the price for their services, and a Medicaid sector, in which they accept the price set by the public program. Sloan, et. al. assumed that physicians maximized utility based on consumer demands for their product, their practice costs, and a trade-off between work and their own leisure.

Participation in Medicaid, then, was in large measure determined by the relative prices paid in the fee-for-service sector versus those paid by the Medicaid program. Other determinants of participation included administrative burdens of the Medicaid program, demand variables made up of exogenous market forces, cost variables made up of personal and practice factors, and political attitudes[1]. The conceptualization developed by Sloan, et. al. has been used in research on participation in the Medicaid program (*e.g.*, Perloff, et. al. 1986, 1987, 1995, 1997), and has recently been extended to the Medicare program (Damiano, et. al. 1997). The author could identify no studies in which a model of physician participation has been used to analyze participation in managed care or participation in more than one segment of the market for physician services.

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[1] Demand variables included: per capita income, physicians per 1,000 population, Medicaid enrollees, board certification, medical school faculty appointment, foreign medical graduate. Cost variables included: wages of nonphysician personnel, nonemployment income, physician gender, number of children for female physicians, physician's health status, physician's age over 60. Political attitudes were measured by the extent of the physicians' agreement to questions regarding whether or not medical care is a right, and the appropriate level of government control over the medical profession.

Summary

The market for physician services has developed and changed as the market for health insurance developed. Today, it may be separated into four segments, based on the type of payer: private indemnity insurers, private managed care organizations, Medicare, and Medicaid. Understanding the implications for consumers and physicians of the increased role of managed care and changes in the Medicare and Medicaid programs requires an understanding of physician participation with each of these sectors of the market. Considerable research has been undertaken regarding physician participation in the Medicaid and Medicare programs, based primarily on an economic model of physician behavior. Less research has been conducted into factors associated with participation in managed care and capitation arrangements, although survey results on the general parameters of involvement with managed care have been published. To date, no research has looked at participation in more than one of these sectors at a time. This study will develop a single, general model of physician participation based on the economic models outlined above. The model is then applied to three sectors of the market of physician services — managed care, Medicare, and Medicaid — and to the intersection of these sectors.

Chapter 3. Conceptual Framework

General model of physician participation

Changes in the market place during the 1980s and 1990s have led to increased competition among health care providers and decreased the power of organized medicine. The forces shaping physician behavior have changed. They now have considerably less ability to set prices in both the public and private sectors. Specifically, Medicare adopted a fee-schedule, PPOs began to negotiate discounted rates, and many HMOs and IPAs began paying physicians according to their own fee schedules or through capitation. Thus, the two-market model, while it may still exist, has changed in the extent to which physicians are price-takers rather than price-setters. To a large extent, physicians have become price-takers in the managed care sector and the Medicare program, as well as in the Medicaid program. As price-setting capacity decreases, the choice facing physicians becomes one of accepting the prices offered by the organizations that exercise control over the demand for medical services: managed care organizations and public sector programs. In other words, they must now choose whether or not to participate with the various sectors of the health care market.

The model outlined below builds on the economic models discussed in Chapter 2, but differs from that developed by Sloan, et. al. by its extension to the managed care and Medicare markets, and the extent to which non-economic factors associated with the individual physician and his/her practice are included. The model is based on economic

theory, but is supplemented by additional factors derived from the health services research literature. It assumes that physicians maximize their utility, taking as given, at least in the short run, the market conditions in their area. The organization of the model is not supply and demand, but characteristics of the physician, his/her practice, and the market. This organization reflects the study's focus on the individual physician and allows for inclusion of factors such as altruism, experience, and practice size that may not easily fit into categories of demand factors and cost factors. Finally, the model also seeks to develop a single set of predictors for participation in three sectors of the medical system (managed care, Medicare, and Medicaid) in order to analyze the intersection of participation in these programs.

Physician participation (PP) in a sector of the market is modeled as follows:

$$PP = f(RP, M, C, P)$$

Where:

RP represents the relative prices (RP) paid in that sector versus other sectors of the market; this is similar to Sloan's category of fee schedules.

M represents other characteristics of the local market, including demand for physician services in each sector of the market and the level of competition among physicians, parallel to Sloan's demand variables.

C represents characteristics of the physician's practice that affect his/her attractiveness to the various players in the market, ability to negotiate with them, and willingness to participate in a program. This conceptualization differs from Sloan's cost variables in that it includes attributes of the practice that might influence demand as well as cost.

P represents characteristics of the physician that affect his/her attractiveness to the various players in the market, ability to negotiate with them, and willingness to participate in a program. This category includes some attributes, such as gender and years of experience that Sloan considered to be cost variables (years of experience is parallel to Sloan's age variable) Other attributes, such as altruism and risk aversion, are parallel to, but broader than, Sloan's enumeration of political attitudes.

Relative prices. The economic theory of utility maximization argues that, on average, physicians will be more willing to participate in a sector of the medical care market that pays higher prices (Feldstein 1988). Thus, an indemnity market, where a physician sets his/her own fees, is most attractive, followed by those discounted fee and fee schedule arrangements that pay higher prices. The relative attractiveness of capitation arrangements is more complex. The return to the physician involves consideration of the expected volume of services to be delivered and the physician's premium for accepting risk, as well as the actual capitation rate (Bodenheimer and Grumbach 1996). Generally, the physician's usual fee — or charge — reflects the

amount received in the indemnity market. Those with higher usual fees relative to others in the same specialty will be less likely to participate in managed care and the public sector programs, as they all use fee schedules or other reimbursement methods that generally result in lower payments. For these physicians, the difference in prices across sectors is magnified and participation in sectors other than the indemnity market will, on average, require a greater discount from the usual fee.

Other characteristics of the local market. By the laws of supply and demand, physician participation in a given sector is constrained by the level of demand for physician services in that sector. In areas with little managed care, for example, physicians will be less likely to have managed care contracts because there is less demand for physician services in this sector. Similarly, the percent of the population that is covered by Medicare and Medicaid will influence physician participation in those programs through the resulting strength of the demand for physicians in these sectors. A greater proportion of Medicare beneficiaries should be associated with a higher level of physician participation with Medicare, while a smaller proportion of Medicaid beneficiaries should be associated with a lower level of physician participation with Medicaid. Economic theory predicts that competition among physicians will also affect physician participation in various sectors. Higher levels of competition, defined as greater physician supply per capita, will result in a greater willingness to participate in sectors that offer lower payment rates. In areas with considerable competition, physicians will be more likely to participate in all sectors of the market to attract any patients for whom the price paid exceeds costs. Population size may also affect a

physician's decision regarding participation with various payers, as a larger market should allow the physician to be more selective in the types of patients in his practice. Therefore, after controlling for demand factors (e.g., the HMO market penetration rate or the proportion of the population that are Medicaid and Medicare beneficiaries) and physician supply, physicians in urban areas should, on average, be less likely to participate in these programs. This prediction is made on the hypothesis that physicians in larger areas will be more able to develop niche markets in the fee-for-service sector, thereby avoiding participation in those sectors with lower remuneration.

Practice characteristics. The size and type of practice (solo vs. single-specialty group vs. multi-specialty group) may influence both a physician's attractiveness to market players and his/her ability to negotiate with them. The literature shows that managed care organizations prefer to contract with multi-specialty and group practices, perhaps because a larger share of their enrollees can be treated by one practice (Bindman, et. al. 1998; Robinson and Casalino 1995). From the physician's point of view, a larger group will be better able to manage financial risk and to meet the administrative requirements imposed by various payers. The average level of illness in the physician's practice may also affect his/her attractiveness to some market players (Kuttner 1998; Iglehart 1994), although case mix is a difficult concept to measure. From the physician's point of view, having a greater share of ill patients or patients who are more seriously ill may make financial risk-sharing arrangements less attractive.

Other attributes of the physician. Attributes of the physician that may influence his/her attractiveness to various players and willingness to participate with them include specialty, years of experience, and board certification status. Each sector has a relative need for certain specialties over others. For example, pediatricians and obstetrician-gynecologists may be most in demand for the Medicaid program (Perloff, et. al. 1987), while managed care organizations may prefer general and family practioners (Weiner 1994), and Medicare beneficiaries may have greater need of medical and surgical sub-specialists to treat beneficiaries that are, on the average, more likely to be sick and to have chronic conditions. Years of experience may influence the attractiveness of a physician to patients and payers if they equate experience with higher quality (Gold, et. al. 1995). Experience may also affect a physician's willingness to accept lower payment rates. Those with less experience are likely to have a less stable practice and will therefore be more amenable to negotiating discounts (Feldstein 1988). Less experienced physicians may also be more attractive to managed care firms looking to establish new kinds of payment systems, such as capitation (Bodenheimer and Grumbach 1996). Another physician characteristic, board certification, is often used as a measure of quality by managed care companies and individual consumers (Bindman, et. al. 1998). Thus, board certified physicians may be at an advantage in obtaining patients in higher-paying sectors of the market.

In addition to the measurable characteristics noted above, physicians may have beliefs and attitudes that affect their willingness to participate in a sector of the medical market regardless of the economic benefits of participation. First, physicians may view

medicine as playing a unique role in society that requires them to provide services to those in most need of care, even if those individuals are unable to pay. The extent of their altruism may negatively impact their willingness to participate in managed care, to the extent that they view this sector as being profit-motivated (McArthur and Moore 1997). It may positively affect their willingness to participate in Medicaid, as it is a program that serves the poor (Sloan, et. al. 1978, Perloff, et. al. 1987). Another attitudinal attribute of the physician is risk-aversion: to what extent is s/he comfortable with placing financial gains at risk for potentially greater rewards? Physicians who are risk-averse will not want to accept capitation payments, for example, which are designed to shift some of the financial risk for a patient from the insurer/health plan to the physician (Bodenheimer and Grumbach 1996).

Summary. Traditionally, the market for physician services has been modeled as a competitive monopoly, in which physicians had some degree of control over prices in a fee-for-service system. As the health care market has become more competitive, physicians' ability to set prices has declined. They are now faced with a market in which insurers, managed care organizations, and public-sector programs use fee schedules, capitated payment systems, and other tools to control costs. Under these market conditions, the physician's choice has become whether or not to participate in each of these sectors.

The general conceptual approach to modeling physician participation in various sectors of the health care market discussed above builds on the competitive monopoly

model of physician services as set out by health economists. It also incorporates additional considerations found through empirical research to be correlated with observed participation rates with managed care and public sector programs. Forces affecting physician behavior are categorized as belonging to one of four groups: relative prices, other attributes of the market for physician services, characteristics of the physician's practice, and those of the physician.

This general model of physician participation is applied to four sectors of the market – managed care, capitation, Medicare and Medicaid — below. Capitation is presented as distinct from managed care contracting, although it is really a sub-set of that segment of the market. Table 3.1 summarizes the expected direction of the relationship between measures of relative prices, and market, practice, and physician attributes and physician participation in managed care, capitation, Medicare, and Medicaid.

Application To specific market sectors

Managed care contracting

What determines a physician's choice to contract with an MCO? Little empirical research exploring this question exists (Freund and Allen 1985). More evidence has been gathered on how MCOs choose physicians (Gold, et. al. 1995a and 1995b). Looking at highly developed managed care markets, such as California, provides additional insights

into the physician characteristics most common in the managed care sector (Grumbach, et. al. 1998; Bindman, et. al. 1998; Robinson and Casalino 1995).

Relative prices. A physician's willingness to contract with MCOs will depend, in part, on the financial reward of a contract with a given MCO versus other insurers. Unfortunately, limits on physicians' disclosure of financial arrangements and the desire of MCOs to withhold such financial information from their competitors means that little information on payment rates is available. In 1994 (the year of the data used in this analysis), MCOs were thought, on average, to pay less than private indemnity insurers, 36 percent more than Medicare, and more than Medicaid on a national level (PPRC 1995). These averages, of course, mask the considerable variation in relative prices that occurs both within and across markets. Fees can even vary among physicians within a plan. Physicians with higher usual fees relative to others in their specialty should be less likely to have managed care contracts, since they are likely to have to accept a greater reduction in fees.

Market attributes. Economic theory predicts that the level of MCO dominance in the local market will determine the demand for physician services in this sector. Physicians in markets with high managed care penetration are more likely to sign contracts due to the concentration of demand for physician services in managed care plans. With a higher level of market penetration, a greater proportion of the demand for physician services is channeled through managed care plans. The level of competition among physicians, as measured by physician supply per capita, may also play a role. In

markets with more competition, physicians will contract with MCOs as a means of maintaining access to patients.

After controlling for managed care enrollment and physician supply, the effect of population size on managed care contracting behavior is predicted to be negative. With a larger population, physicians will have more opportunities to specialize their practice and develop niche markets that avoid the constraints involved with managed care contracting. This prediction appears to contradict survey data that indicate that managed care is more prevalent in larger markets (InterStudy 1997). In addition, research on managed competition (Kronick, et. al. 1993) predicted that a population of at least 180,000 would be required to support three competing health plans that would provide all primary care and most specialty services with some sharing of tertiary capacity. A population of 1.2 million would be needed for 3 fully independent plans. The authors estimate that 29 percent of the U.S. population lives in markets smaller than 180,000. Furthermore, in 19 states, more than 50 percent of the population lives in markets where managed competition would not be feasible without additional regulation. In 42 states, at least 20 percent of the population lives in areas with a population smaller than 180,000. However, these findings, which indicate that managed care is more feasible in urban areas, speak to the relationship between population size and the demand for managed care. After controlling for market demand, however, it is hypothesized that the conditional effect of population size on managed care contracting is negative.

Practice attributes. Several attributes of a physician's practice may also play a role in his/her choice to sign contracts. First, the practice must be able to administer contracts, a function that is generally performed more efficiently in larger groups. Also, the practice must be attractive to MCOs, which tend to prefer group practices, and often multi-specialty groups (Robinson and Casalino 1995, Bindman, et. al. 1998). Finally, the relative cost of a physician's patients may play a role: a physician with sicker patients may prove to be less attractive to MCOs (Davis, et. al. 1994). Similarly, a practice with high numbers of uninsured or poor patients may be less attractive to MCOs seeking to capture a more affluent section of the market (Bindman, et. al. 1998). The use of economic performance measures by MCOs in physician evaluations and contract renewals suggests that the cost of a physician's practice does play a role in MCO's selection of physicians (Gold, et. al. 1995).

Physician attributes. One principle of managed care is reliance on primary care physicians for most routine care, as a gatekeeper for referral to specialists, and as a means to control costs. Thus, primary care physicians are generally more likely to obtain contracts than specialty physicians (Emmons and Simon 1996). However, MCOs must also contract with specialists to offer their enrollees access to needed/desired physicians and to ensure adequate quality of care. Other physician characteristics preferred by MCOs include board certification and a clean malpractice history, both seen as measures of quality that can be communicated to plan members (Gold, et. al. 1995). A physician with considerable experience outside a managed care environment and a stable practice may be able to continue practicing without managed care contracts. This would suggest

that more experienced physicians are less likely to have contracts. Also, at the time of the survey, very few Medicare beneficiaries were in managed care plans. Thus, physicians with a large share of elderly patients covered by Medicare might also have less need to contract with MCOs in order to obtain access to patients; more experienced physicians tend to have more Medicare patients (Damiano, et. al. 1997).

The concept of risk aversion comes from the economics literature. When asked to choose between a certain outcome of a specified value and a gamble that has an equivalent expected value, a person who is risk averse prefers the certain outcome (Binger and Hoffman 1988). A physician who is risk-averse may avoid managed care contracts, since they generally share financial risk for patient care with the contracting physician. The mechanisms for sharing risks vary considerably. Examples include bonuses based on productivity or referral rates (for primary care physicians), withholdings from payments that will be distributed at the end of the year only if targets for inpatient care are met, and full or partial capitation.

A physician's beliefs about the social role of medicine may also lead him/her to limit participation with managed care. Thus, altruistic physicians may desire to stay out of for-profit medicine, or to serve under-served populations not covered by any health plan (McArthur and Moore 1997). Finally, those who worry about discrimination in awarding contracts note that physician gender, race, and age also seem to play a part in determining whether or not s/he gets contracts (Lavisso-Mourey, et. al. 1996; Scott Collins, et. al. 1997). However, the one empirical study examining the relationship

between physician ethnicity and denial and/or termination of contracts found no such link (Bindman, et. al. 1998).

Capitation

Many of the same factors shaping a physician's choice to contract with managed care might also be expected to affect his/her decisions regarding capitation arrangements. MCOs would want to offer capitation to have a more or less definite "budget" (defined expenditure per enrollee, with add-ons for high-cost patients, etc.) and to shift financial risk to the physicians. Physicians may want to accept capitation in order to increase control over funds and decrease exposure to "arbitrary" fee schedules.

Relative prices. It is difficult to compare capitation payments to fee-for-service payments, as both the cost and volume of services delivered affect the physician's net gain from provided services under a capitated contract.

Market attributes. At the market level, areas with more managed care are likely to have more opportunities for capitation. Indeed, the use of capitation varies by region, with a similar breakdown as that for managed care penetration (Simon and Emmons 1997). Economic theory suggests that competition among physicians may also affect the prevalence of capitation. A higher supply of physicians per capita should lead to more capitation, as competition among physicians leads to greater acceptance of alternative payment schemes. After controlling for managed care enrollment and physician supply, physicians in a larger market (i.e., greater population) should be less

likely to be capitated because a larger patient pool will, on average, make it easier for physicians to be selective in which patients to accept.

Practice attributes. At the level of the practice, larger groups will be better able to manage the financial risk associated with capitated contracts. With a larger combined patient load, physician groups can spread the risk over a larger pool (Bodenheimer and Grumbach 1996). In areas with high managed care penetration, such as California, capitated multi-specialty groups are becoming more and more common (Robinson and Casalino 1995). As with managed care contracting, the relative costs of a physician's patients may influence his/her decisions regarding capitation. If s/he has higher-cost patients, then accepting capitation poses greater financial risk in the absence of adequate risk adjustment of capitation payments (Bodenheimer and Grumbach 1996). Physicians with a more severe case mix will be less likely to have capitated contracts in the absence of risk adjustment.

Physician attributes. At the physician level, MCOs are known to offer capitation for primary care services more often than for specialty services; therefore primary care physicians are more likely to have capitated contracts (Bodenheimer and Grumbach 1996). Other specialties with a defined product, such as childbirth for obstetrician-gynecologists, or well-baby visits for pediatricians, may also be more likely to be capitated. Since board certification is often a criterion for participation in MCO plans, a positive relationship should also exist between certification and capitation (Gold 1995). The physician's aversion to risk should play a large role in accepting capitation, given the

risks it carries (Bodenheimer and Grumbach 1996). Physicians who are more risk-averse are less likely to accept capitation. Similarly, altruism may lead physicians away from capitation as it limits his/her practice to those who are insured through often for-profit MCOs, and may limit the ability to subsidize costs associated with free and reduced fee care (McArthur and Moore 1997).

Physician Participation in Medicare

For the purposes of this analysis, participation with Medicare is defined as having served patients whose primary source of coverage was Medicare in the 12 months preceding the survey. This definition is different from being in the Participating Provider (PAR) Program, in which a physician agrees to accept Medicare-allowed charges as payment in full, without balance billing to the patient. In return, PAR physicians are paid a higher fee from Medicare, are listed in the PAR physicians directory, and receive payment in a timely manner (Colby, et. al. 1995). In 1995, PAR physicians accounted for about 90 percent of Medicare's payments to physicians. Whether or not the physician is accepting all, some, or no new patients who are Medicare beneficiaries is another measure of participation that has been studied (*e.g.,* Damiano, et. al. 1997). Provision of Medicare services is used as a dependent variable in this analysis because it measures the actual provision of services. By contrast, the other two definitions measure the physician's willingness to participate, whether or not it is realized in practice.

Participation with the Medicare program is primarily decided by the physician. HCFA will reimburse virtually all physicians the allowable charge, whether or not they

accept Medicare assignment. Physicians will want to serve Medicare beneficiaries to have access to a large market; in 1997, Medicare accounted for almost 18 percent of physician payments nationally (HCFA 1998).

Comparative prices. Numerous studies have found that lower fees in public sector programs lead to lower physician participation, although they differ on the magnitude of the effect (Rice 1997; Gabel and Rice 1985). PPRC estimated that in 1994, Medicare paid about 50 percent of what the average commercial insurer paid for a service, and 70 percent of the average Blue Cross/Blue Shield payment (Eisenberg 1994). A study from 1993 indicated that while there was variation by region and type of service, Medicare did compare favorably to the private sector for office visits, but not for hospital visits (Miller, et. al. 1993). Physicians with higher usual fees compared to others in their specialty should be less likely to participate in Medicare, as doing so would result in a greater discount over their usual charge.

Market attributes. Economic theory predicts that a physician's decision to serve Medicare patients will depend, in part, on the proportion of the Medicare-eligible population in the market. An additional market force is competition among physicians: in a market with a high physician to population ratio, they may have a more limited choice of patients. Therefore, in these markets, physicians will be less able to limit themselves to privately insured patients with indemnity coverage, and more likely to provide services to Medicare beneficiaries.

Practice attributes. Few characteristics of a physician's practice would seem to affect the decision to provide Medicare services. One exception might be large group practices that have exclusive contracts to serve an MCO's plan members: they may have fewer Medicare patients because their practice will be limited to the MCO's plan members.

Physician attributes. At the level of the physician, specialty is likely to play a role in the physician's decision to provide Medicare services. Obviously, pediatricians will have limited contact with Medicare since the program primarily covers the elderly. However, some disabled children and children with end-stage renal disease are Medicare beneficiaries. Similarly, the patient pool for obstetrician-gynecologists is primarily made up of younger women, although some older women will also have need of their services. Research indicates that older physicians tend to have more Medicare patients (Weiss and Blustein 1996), as they age with their patients. In addition, the elderly may prefer older physicians. Notions regarding the social role of medicine and other noneconomic considerations, such as enjoyment in treating Medicare patients, may also impact a physician's choice to provide Medicare services, even when payment rates are lower than those offered by commercial insurers (Damiano 1997).

Physician Participation in Medicaid

As with the Medicare program, physician participation with Medicaid is primarily dependent on the physician, as virtually all providers will be reimbursed the allowable charge under the program. Physicians will accept Medicaid beneficiaries to have access

to a fair-sized market. Considerable research was undertaken in the 1980s and early 1990s to look at physician participation in the Medicaid program, as participation rates declined. The research focused on the gap between Medicaid fees and payment rates in the private insurance sector, the geographic distribution and qualifications of physicians, and the location of underserved populations (Sloan, et. al. 1978; Davidson 1982; Perloff, et. al. 1997, 1995, 1986; Mitchell 1991; Fox, et. al. 1992; Fairbrother, et. al. 1995; Cykert, et. al. 1995; Silverstein and Kirkman-Liff 1995).

Relative prices. The often inadequate reimbursement provided by the Medicaid program has led to limited participation by many practitioners (Sloan, et. al. 1978; Perloff, et. al. 1987; Perloff, et. al. 1995). The relative price varies by state, as state agencies administer the program, setting both eligibility rules and payment rates. In 1990, the national average of Medicaid payments was estimated to be 85 percent of Medicare allowed charges and 65 percent of private fees (Holahan, et. al. 1991). This average masks variations among states. Physicians with a higher standard fee relative to others in their specialty should be less likely to participate in Medicaid programs, as doing so would result in a greater discount over their usual fees.

Market attributes. Areas with lower per capita incomes and higher rates of poverty should have more Medicaid beneficiaries, and thus a larger market for physicians. However, the variation in eligibility rules by state will also play a role in determining the size of the Medicaid market (Holahan, et. al. 1991). The concentration of beneficiaries in inner cities and rural areas may also affect demand for physician

services by location (Perloff, et. al. 1997). Economic theory suggests that, in the short run, the level of competition among physicians may affect their willingness to accept more Medicaid patients: with more physicians in the area they may have less choice of patients. In the long run, physicians may change markets to equalize the level of competition across markets.

Practice attributes. At the level of the practice, some types of providers, such as those working in community health centers and outpatient departments of hospitals, are more likely to see Medicaid beneficiaries. These types of providers are also more likely to provide charity or reduced-fee care to the uninsured (Fairbrother, et. al. 1995; Kaiser Commission 1995).

Physician attributes. At the level of the physician, certain specialties, such as pediatricians and obstetrician-gynecologists, are more in demand for the Medicaid population. Some studies (Fairbrother, et. al. 1995) have shown that Medicaid physicians tend to be younger than the average physician, less likely to be board certified, and more likely to be graduates of foreign medical schools. It is more likely that these types of physicians are less desired by MCOs and people with other types of coverage, rather than more desired by Medicaid beneficiaries. Altruism, or belief in a social role of medicine, may lead some physicians to participate more fully in the Medicaid program (Sloan, et. al. 1978).

Table 3.1 Conceptual Framework - Expected Direction of Effects

	Managed Care Participation	Acceptance of Capitation	Medicare Participation	Medicaid Participation
Comparative Prices				
Physician's Usual Fees	–	–	–	–
Managed Care Fees (FFS)	+	–	–	–
Capitation Rates	+	+	–	–
Medicare Fees	–	–	+	–
Medicaid Fees	–	–	–	+
Market Characteristics				
Managed Care Demand	+	+	–	–
Medicare Demand (non-HMO)	–	–	+	–
Medicaid Demand (non-HMO)	–	–	–	+
Competition among physicians	+	+	+	+
Population size	–	–	no effect	–
Practice Characteristics				
Size	+	+	no effect	no effect
Multi-specialty group	+	+	no effect	no effect
Average cost of patients	–	–	no effect	no effect
Physician Characteristics				
Specialty Primary Care (incl. peds)*	+	+	+*	+
Specialty -Specialist (incl. Ob/gyn)**	–	–	+**	–**
Years of Experience	–	–	+	–
Board Certification	+	+	no effect	–
Altruism	–	–	+/?	+
Risk Aversion	–	–	+	+

* Pediatricians are less likely to participate in Medicare.

** Obstetrician/gynecologists are less likely to participate in Medicare and more likely to participate in Medicaid.

Chapter 4. Research Methods

This chapter outlines the research methods used to apply the conceptual model developed in chapter 3. First, data sources are discussed, followed by the level of analysis and the analytic sample. A third section introduces the variables used in the study. A final section details the statistical methods used in the analysis.

Data sources

Primary Source. The primary data source is the American Medical Association's Socioeconomic Monitoring Survey (SMS) conducted in the spring of 1994. The results of this survey were published in 1995 and made available for use by researchers outside of the AMA in 1997. The survey includes responses from 4,110 physicians and is nationally representative. A simple random sample was drawn from the AMA's Physician Masterfile and includes non-federal, patient-care physicians (excluding residents) who work at least 20 hours per week. The Masterfile includes both members and non-members of the AMA.

The AMA takes steps to obtain the best possible response rate for the SMS. For example, advance notification of the survey is provided, including a brochure describing the survey and a summary of the questions to be asked. The survey is completed primarily by telephone, using computer-assisted telephone interviewing (CATI)

techniques. Appointments for interviews are made at the physicians' convenience. Multiple calls are allowed in order to finish the survey and physicians are given a toll-free number to contact the survey team to complete interviews. Extensive efforts are made to encourage physicians who originally refuse to respond to participate in the survey. To assess the validity of the survey and measure changes over time, approximately 35 percent of the sample consists of re-interviews of physicians surveyed the previous year (Gonzalez 1995).

Despite these efforts, the overall response rate for the survey was 63 percent. Thus, unit non-response is a concern with this dataset (item non-response is discussed below). A comparison of the respondents to the sample population shows that response rates are different for certain subgroups of physicians. According to the AMA, specialty and AMA membership status are the two characteristics for which response rates differ most. In particular, non-response is highest for internal medicine (44.5%) and general/family practice (40.2%) physicians, and lowest for pathologists (26.2%). (These figures are weighted averages of non-response among both initial and re-interview physicians. The re-interview sample has consistently higher response rates than the initial contact sample.) Non-members of the AMA were less likely than members to respond (non-response rates of 42.5% and 28.6%, respectively). Appendix 1 includes further information on non-response by type of physician. Using comparisons of respondents versus non-respondents, the AMA constructed weights to partially correct for non-response bias by specialty (10 categories), sex, years since graduating medical school, AMA membership status, and board certification status. Even after applying these

weights, non-response bias may be an issue, limiting the generalizability of the findings. For example, if responding physicians are less likely to be involved in managed care than nonrespondents, then conclusions regarding participation with managed care would be understated. Overall measures of participation will be biased downward, and the effects of any correlates that are related to participation will also be understated. This may be the case if, for instance, physicians involved in managed care face greater time pressures than those who are less involved in managed care, and lack of time is a major reason for nonresponse.

Despite these problems, the SMS remains one of the most reliable physician surveys because it is conducted annually, with measures taken to minimize and correct for non-response. Other physician surveys have also been plagued by low response rates (Remler, et. al. 1997; Tambor, et. al. 1993). Reasons for low response rates may include the time-pressures associated with the practice of medicine and the level of detail requested in the survey. The annual series and reinterview portion also allow for validity checks on the sample questionnaire, which has been refined periodically since its inception in 1981.

The SMS is one of the primary sources of information on physicians in the U.S. The AMA publishes the basic data from the SMS in two annual series, Socioeconomic Characteristics of Medical Practice, and Physician Marketplace Statistics. Recent studies have used the SMS to document trends in the growth of managed care contracting and capitation (Simon and Emmons 1997; Emmons and Simon 1996), trends in physician

employment and workforce issues (Simon, et. al. 1997a, Simon, et. al. 1997b; Kletke, et. al. 1996), and changes in physician income (Simon, et. al. 1998; Simon and Born 1996).

This dataset was chosen for this analysis because it contains a national sample of physicians and considerable information on managed care contracting, as well as characteristics of the physician and his/her practice. In addition, the data were collected in a manner that allowed for the merger of variables from other datasets concerning the physician's market.

Secondary sources - Market information. The SMS data were supplemented by population and market characteristics obtained from the 1996 update of the Area Resource File (ARF). The ARF is developed and maintained by the Health Resources and Services Administration (HRSA) of the federal Department of Health and Human Services (DHHS). The dataset contains time-series data on numerous socioeconomic and health characteristics at the county level. The data are collected from many differences sources, including the AMA Masterfile, the Census Bureau, and the InterStudy Census of HMOs (Stambler 1988). Variables from the ARF are for 1994 or the year closest to 1994. For physicians in metropolitan areas, the market data were merged at the level of the metropolitan statistical area (MSA). For physicians in non-metro areas, data are for the county level. Due to the AMA's confidentiality concerns, ARF variables were merged with the SMS by the AMA. All identifying information was then deleted from the dataset. This concern for privacy limits the geographic break-down of the data to 27 groups: nine census divisions and three population size criteria.

Secondary sources - Relative price information. Information on relative prices across payers is difficult to obtain through published literature. Fees paid by MCOs are especially difficult to obtain, and may vary from contract to contract (Gold, et. al. 1995). Comparisons between managed care and other payers are also difficult, for a number of reasons. First, little information on managed care fee schedules is publicly available. Second, the total remuneration from managed care companies may include bonuses, withholds, or other payments/penalties that are not included in the fee schedule (PPRC 1996).

Medicare fee schedules, by contrast, are a matter of public record. The Physician Payment Review Commission (PPRC), and later the Medicare Payment Advisory Commission (MedPAC), collect data comparing Medicare fees to the private sector, using data from the Health Insurance Association of America (HIAA), HCFA, and special surveys. For the year of this survey, the figures PPRC published in the 1995 Annual Report to Congress are most relevant. These data are presented and meant to be compared at a national level, however, and may not be reliable for smaller geographic units. A number of special studies (Verrilli and Zuckerman 1996; Miller, et. al. 1993) have also compared Medicare to private sector fees, including PPO and managed care organizations. Again, complete results are published at the national level only, although Miller, et. al. also published data for the highest and lowest quartile of localities.

In the SMS, a sub-set of physicians were asked if their managed care contracts paid more or less than Medicare, but the question was dropped from the survey before it

was completed. Of the 489 physicians answering the question, 28 percent indicated that managed care payments were higher than Medicare while 58.3 percent said they were the same and 13.7 percent said they were lower.

For the Medicaid program, fees are set by the states. They are, therefore, available, but only rarely compiled on a national basis.

Given the limited availability of information on comparative prices, data were obtained from the published results of a study conducted by the Urban Institute (Holahan, et. al. 1993). The data compare fees between Medicaid, Medicare, and the private sector in 1990. The Medicaid fees come from a survey of states conducted by the Urban Institute, the Medicare fees come from HCFA's Medicare Part B data procedure and prevailing charge files. Private fees come from a database of claims maintained by HIAA. These data were collected at the state level. For this analysis, they were aggregated to the level of nine census divisions, weighted by the population size of each state in the census division. In addition, the ratio of Medicare to private sector fees used in this analysis was calculated from data on Medicaid fees compared to both Medicare and private sector fees.

These comparative price data have a number of limitations. First, they are purely ecological, since all price comparisons are based on averages across physicians and services, rather than the payments actually received by each physician. In the managed care sector, these payments can vary from physician to physician, even though they are

providing the same service. In all sectors, the prices facing an individual physician also depend on the set of services s/he provides. Second, the relative prices developed by Holahan, et. al. are based on 54 physician services common in the Medicaid program. Therefore, the data provide a good comparison of fees paid to physicians treating infants, children, and the disabled (the procedures used in the analysis account for more than 50% of spending on these groups), but are "somewhat less representative" for older women and men. In addition, the comparisons are made only at the level of the state. The private-sector fees come from physicians' billed charges not reimbursed amounts. Therefore, it does not include managed care or other discounts, and over-estimates private fees. Finally, all of the data is for 1990, several years before the survey used in this analysis and before the MFS was phased in.

Despite these limitations, the Holahan, et. al. data does compare three sectors over a common set of physician services at the state level. Furthermore, the Medicare and Medicaid fees are both compared to the same estimate for fees in the private sector. No other comparative data were available to the author without obtaining claims data and developing a procedure to calculate the comparisons.

Level of analysis and analytic sample

The primary unit of analysis for this study is the individual physician. The analysis incorporates information on the characteristics of the physician, his/her practice, and his/her market. For this analysis, the market is considered to be the Metropolitan Statistical Area (MSA) in which the physician practices for urban physicians, and the

county for physicians in nonmetropolitan areas. This definition of the market allows for a fairly broad geographic range from which a physician may draw patients. In examining a national sample, it should offer sufficient variation across regions. It may, however, fail to distinguish differences in neighborhoods within an MSA that differ dramatically. For example, poor inner-city neighborhoods and affluent urban districts will fall within the same MSA. In the hospital literature, some questions have emerged as to the suitability of the MSA as a market definition (Zwanziger, et. al. 1990). Nevertheless, the MSA remains the most common unit of market analysis in health services research, perhaps because the census bureau and other institutions use it to define their samples (Kronick, et. al. 1993; Hicks and Glen 1989).

The SMS dataset includes information on 4,110 physicians. The analysis presented here was conducted on a subset of these physicians. First, physicians who primarily work in a hospital setting (816) — radiologists, anesthesiologist, pathologists, and emergency medicine physicians — were excluded because the survey did not ask them about a number of issues important to the model, including participation in the Medicaid program and percent of patients uninsured. It is also reasonable to assume that their decision-making regarding the patients they see is different from other physicians, as most of their patients are under the care of another physician to whom they are consultants. Physicians working as HMO employees were also excluded (117), as they are limited to serving patients only in the HMO for which they work. Employees of other physicians or institutions were included in the analysis, however, because they are assumed to have some control over the types of patients they see, within the bounds set

by their employers. Contractors (110), by contrast, were excluded because they are assumed to have a short-term relationship with their practice, and no control over the types of patients they see. In addition, item non-response was high for contractors on important variables. Finally, the remaining physicians that did not have information on participation with managed care, Medicare, and Medicaid were excluded (153).

The analytic sample contains 2,914 non-federal, patient care physicians who are not in the hospital-based specialties (radiologists, anesthesiologists, pathologists, and emergency medicine physicians) or employees of an HMO. Table 4.1 compares the excluded and included physicians by demographic characteristics. The two groups were not significantly different by region of residence or the percent of female physicians. However, the excluded physicians are significantly more likely to have graduated from medical school more recently (p=.001). This indicates that the generalizability of results across experience groups may be limited.

Table 4.1 Comparison of Physicians Included and Excluded from Sample

Demographic Variable	Percentage of Phys. Included in Analysis (n=2914)	Percentage of Phys. Excluded from Analysis (1196)
Sex		
Male	85.6%	83.6%
Female	14.4	16.4
Decade graduated Medical School		
1940s and earlier	2.7	1.4
1950s	9.9	7.8
1960s	22.9	18.1
1970s	31.3	30.2
1980s and later	33.1	42.5
Census Division		
New England	6.4	6.3
Mid-Atlantic	18.0	15.2
East North Central	15.3	16.0
West North Central	6.7	6.5
South Atlantic	17.8	16.0
East South Central	5.5	5.2
West South Central	9.5	9.8
Mountain	4.7	6.2
Pacific	16.2	18.8

Variable definition and construction

This section first introduces the response variables, followed by the explanatory variables. Table 4.2 presents the survey questions for the response variables. All of the variables are summarized in Table 4.3. A summary of the SMS survey questionnaire can be found in Appendix 2.

Response variables

Four sets of response variables will be explored.

Participation in managed care: (a) whether or not a physician has a managed care contract (yes/no); and (b) for those physicians who do have a managed care contract, the percent of total revenues from managed care.

Participation in capitation arrangements: (a) whether or not a physician has a capitated contract (yes/no); and (b) for those physicians who do have capitated contracts, the percent of managed care revenues from capitation.

Participation in Medicare: (a) whether or not a physician provided Medicare services in the previous 12 months (yes/no); and (b) the percent of a physicians' current patients who are Medicare beneficiaries.

Participation in Medicaid: (a) whether or not a physician has Medicaid patients (yes/no); and (b) the percent of a physicians' current patients who are Medicaid beneficiaries.

Nonresponse for dependent variables. A number of physicians replied "don't know," refused to answer, or were simply missing information for dependent variables . For the variable measuring the percent of revenues from managed care (MCREV), 3.8 percent of the analytic sample (110 of 2,914 physicians) responded "don't know." These observations were not considered in the analysis of MCREV, introducing the possibility

of item nonresponse bias. Those missing this variable were more likely than those with information have graduated from medical school since 1980 (p=.03, data not shown). There were no statistically significant differences by sex or region of residence.

Furthermore, 7.2 percent of physicians did not know whether or not they had any revenues from a capitated contract (CAPREV). This lack of knowledge about financial arrangements has been found in other surveys (Project HOPE 1995), and may reflect the complexity and recent arrival of capitated contracts. As with MCREV, those missing CAPREV were more likely to be female (p=.0001, data not shown), and to have graduated medical since 1980 (p=.0001, data not shown). Given the extent of unit non-response for this variable, the analysis of capitation arrangements should be considered preliminary.

Unit nonresponse on the percent of patients covered by Medicare (PMCARE) was 0.7 percent (21 of 2,914 physicians). These observations were not considered in the analysis of PMCARE. Given that these observations represent such a small percentage of the total sample, the extent of item nonresponse bias is likely to be minimal.

Table 4.2 Survey Questions For Response Variables	
Managed Care	MCCONT - Do you or does your practice have any managed care contracts? MCREV - What percentage of your practice revenues are obtained under all managed care contracts combined? *Definition:* Managed care plans include, but are not limited to, HMOs, PPOs, and IPAs. Managed care plans are distinguished by the use of financial incentives or specific controls to limit utilization to a set of specific providers, services, or sites. Prior authorization review and other utilization review may also be characteristic of these plans.
Capitation	CAPIT – Constructed. Defined as MCPCAP > 0. CAPREV - Now considering only your managed care revenues, what percentage of these are earned on a capitated basis? *Definition:* Capitation refers to an arrangement where payment for medical services is prepaid and does not vary with the number or type of services provided.
Medicare	DMCARE – During the last twelve months did you provide any services to patients whose principal source of payment was Medicare? PMCARE - What percent of your current patients are covered by Medicare?
Medicaid	DMCAID – Constructed. Defined as PMCAID > 0. PMCAID - At this time, approximately what percentage of your patients receive Medicaid benefits?

Explanatory variables

The study will investigate numerous explanatory variables, organized according to the four categories outlined in the conceptual framework: comparative prices between the sectors of the market, other attributes of the market, attributes of the physician's practice, and attributes of the physician.

Relative prices. As noted above, relative price information was obtained from Holahan, et. al. (1993). Two ratios are included: (i) the ratio of Medicaid fees to private

charges; and (ii) the ratio of Medicare fees to private charges. Since these ratios are available only at the level of the state, the comparative fees for each state were aggregated to the level of the nine census divisions, weighted by the share of the region's population residing in each state. Appendix 3 includes a table showing the average and range of the ratios for each census division.

Unfortunately, there is no comparative data on managed care reimbursements versus private charges. The limited studies that examine managed care fees indicate that there is great variation between MCOs, as well as across geographic regions (Verrilli and Zuckerman 1996). The potential bias introduced by this omitted variable is discussed in Chapter 7.

The physician's usual fee for an office visit of an established patient is used to represent the standard fee of one physician versus another. It also represents the physician's charge in the private indemnity market. For psychiatrists, the measure is the usual fee for a psychotherapy session; for ophthalmologists it is the fee for an ophthalmologic exam. To control for differences across specialty, an index was created comparing a physician's fee against others in his specialty (FEEINDX3). Data on usual fees were missing for 406 (12 percent) of the physicians in the analytic sample and were imputed based on the values for physicians with fee information. The imputation methods used result in a bias toward the null hypothesis that the fee index variable has no statistically significant impact on the outcome variables. Therefore, the effects of physicians' fees on their participation in managed care, capitation, Medicare, and

Medicaid will be underestimated. For further information, see Appendix 4 - Data Imputation.

Market attributes. Demand for physician services in the managed care sector is measured by the HMO market penetration rate in the physician's MSA, as reported in the ARF. HMO market penetration is defined as the percent of the population that is enrolled in an HMO. This variable is somewhat problematic, as it measures only HMO penetration, rather than the broader managed care penetration. In addition, the InterStudy data included in the ARF come from a survey of HMOs. InterStudy allocated all enrollment for a given HMO to the location of its headquarters, rather than proportionally to the HMO's service areas. Thus, HMO penetration is likely to be over-estimated in MSAs with HMO headquarters and under-estimated in other MSAs.

Demand in the Medicare sector is measured by the percent of the population in the MSA that is age 65 or more. Demand in the Medicaid sector is measured by the per capita income in the MSA. It would be preferable to use the percent of the population enrolled in Medicaid as the demand variable. Although these data are available from the ARF, they were not merged with the SMS dataset. Hence, per capita income is used as a proxy. The percent of population that is poor was also explored as a proxy, but was found to be less predictive than the per capita income.

Competition among physicians is measured by the overall supply of physicians per 10,000 population. The population size of the MSA is also be included as a market

attribute. MCOs are generally more active in larger cities than in rural areas (InterStudy 1997). Urban areas are defined as those MSAs with a population of 50,000 or more. These data also come from the ARF.

Practice attributes are primarily represented by the concept of practice size. This variable is broken into four categories for physicians in a practice setting: solo practice, 2-5 physicians, 6-10 physicians, and 11 or more physicians. Those physicians employed in a setting other than a practice (e.g., hospital, medical school, university/college, or local government) are considered "institutional" physicians. Of the 540 physicians working for institutions, 27 percent are employed by private hospitals, 20 percent work in medical schools, 17 percent work for a university or college, 15 percent work for a local government, and 18 percent work for some "other" type of employer. While the creation of a category of institutional physicians is problematic in that it puts together physicians who are possibly very different (e.g., those working for a local government versus those in an academic medical center), it allows for the inclusion of physicians working outside of the private practice setting to be included in the analysis. Recent debates over the future of public health clinics, community health centers (Lipson 1997), and academic medical centers (Anderson, et. al. 1999), among others, indicate that these institutions are also responding to the increasingly competitive health care market. Thus, with the inclusion of institutional settings, the concept of practice size is captured by five categories.

The concept of practice size is treated as categorical on the hypothesis that the effect being measured is not a marginal effect of adding one more physician, but an overall effect of the group size: solo, small group, medium group, large group, or institution. In addition, bivariate analyses suggested non-linear relationships between practice size and the dependent variables. The number of physicians in the practice was imputed for 29 physicians (1 percent of the analytic sample; see Appendix 4 for details). The type of practice will be indicated by a dummy variable that is 1 if the physician is in a multi-specialty group and 0 otherwise.

Physician attributes. The concept of experience is measured as decades in practice since medical school. This specification is used instead of age, as a physician's attitudes and abilities are thought to be more affected by the length of time spent practicing medicine than by the passage of time. In addition, a physician who has been in practice for a number of years is likely to have a larger and more stable practice regardless of his/her age. The physician's specialty is indicated as one of seven nominal values (general/family practice, internal medicine, surgery, pediatrics, obstetrics/gynecology, psychiatry, and "other").

Two dummy variables measure other attributes of the physician: gender (1=female) and board certification status (1=certified). A dummy variable indicating whether or not the physician has an ownership interest in his practice (1=yes) is included as a proxy for risk-taking, on the hypothesis that managed care contracting, and especially acceptance of capitation, is more likely among physicians willing to take risks.

A final variable will capture the percent of the physician's practice who are uninsured. This variable is included as a proxy for altruism on the part of the physician, but may not be a perfect proxy. Although the majority of uninsured persons are poor and near poor (Bennefield 1998), not all of a physician's uninsured patients will be poor. Certain specialties, such as psychiatrists and plastic surgeons, provide services that generally have limited insurance coverage. They are more likely, therefore, to have more uninsured patients in their practice. This will introduce some measurement error into the analysis of altruism as a factor in physicians' decisions regarding participation in various sectors of the health care market. Due to missing data, this variable was imputed for 101 physicians (3.5 percent of the analytic sample), as explained in Appendix 4.

Table 4.3 Variables

Variable	Name	Source
Response Variables		
Physician has managed care contract (1=yes)	MCCONT	SMS
Percent of revenues from managed care (where MCCONT=1)	MCREV	SMS
Physician has Medicare patients (1=yes)	DMCARE	SMS
Percent patients Medicare (where DMCARE=1)	PMCARE	SMS
Physician has Medicaid Patients (1=yes)	DMCAID	SMS
Percent patients Medicaid (where DMCAID=1)	PMCAID	SMS
Physician has capitated contract (1=yes)	CAPIT	SMS
Percent of revenues from capitation (where CAPIT=1)	MCPCAP	SMS
Explanatory Variables – Comparative Prices		
Physician's fee for office visit, established patient (index)	FEEINDX	SMS
Medicare fees compared to private fees	MCRPRI	Holahan, et. al.
Medicaid fees compared to private fees	MCDPRI	Holahan, et. al.
Explanatory Variables - Market Attributes		
HMO penetration	HMOPOP	ARF
Percent of population over age 65	ARF65	ARF
Per capita income (10,000s)	ARFPCI92	ARF
Physician supply per 10,000 pop.	DOCPOP	ARF
Urban residence (50,000+)	URBAN	ARF
Explanatory Variables - Practice Attributes		
Practice size (solo, 2-5, 6-10, 11+, institution)	N2TO6, N6TO10, N11PLUS, NINST	SMS
Practice type (1=multi-speciality, 0=single-specialty)	MULTI	SMS
Explanatory Variables - Physician Attributes		
Gender (1=female)	ZSEX	SMS
Decades of experience	MEYRCAT1	SMS
Specialty (general/family practice, surgery, internal medicine, obstetrics/gynecology, pediatrics, psychiatry, other)	GP/FP, SUR, IM OBGYN, PED, PSYCH, OTHER	SMS
Board certification status (1=yes)	CERT	SMS
Ownership Status (1=owner, 0=employee/contractor)	OWN	SMS
Percent of patients uninsured	PATUN	SMS

Statistical methods

The analysis begins with a two-stage model for each set of dependent variables. Each of the binary outcomes is analyzed using logistic regression, followed by ordinary-least-squares (OLS) regression for continuous outcomes, among those physicians for whom the binary variable equals 1. The two-stage analysis is followed by polytomous logistic (multinomial logit) regression (PLR/MLR) of the relationships among dependent variables. Specifically, the physicians are grouped by two cross-tabulations: having managed care contract(s) (Y/N) by having Medicare patients (Y/N); and having managed care contract(s) by having Medicaid patients. This specification allows, for example, comparison of physicians with both managed care contracts and Medicare patients to those who have neither. A third polytomous regression looks at patterns of physician participation with the different sectors of the market. The classification developed in Chapter 6 has four categories: (a) those who participate in all three sectors (managed care, Medicare, and Medicaid); (b) those who participate in managed care only, or managed care and one of the public sector programs; (c) those who do not participate in managed care but do participate in one or both of the public sector programs; and (d) those who do not participate in any of the sectors included in the analysis.

In order to facilitate comparisons across dependent variables, the same set of independent variables will be used for all of the analyses. Therefore, model-building did not include removing insignificant terms from regression equations. All analyses were

conducted using analytic weights provided by the AMA, rescaled to sum to the sample size of 2,914.

Analysis of binomial outcome variables

For the investigation of the correlates of managed care contracting, acceptance of capitation, and participation in the Medicare and Medicaid programs, logistic regression analysis was used. Logistic regression is appropriate for investigation of binomial response variables and continuous or nominal explanatory variables (Agresti 1984; Hosmer and Lemeshow 1989). Logistic regression models the probability that a given outcome is obtained (e.g., that a physician has a managed care contract):

$$\Pr(y_i = 1 \mid X_i) = e^{\alpha + \sum_{j=1}^{p} \beta_j X_{ij}} \Big/ 1 + e^{\alpha + \sum_{j=1}^{p} \beta_j Xij}$$

By taking a logit transformation of Pr(y=1), the following functional form is estimated:

$$\ln(p_i / 1 - p_i) = \alpha + \sum_{j=1}^{p_{rp}} \beta_j RP_{ij} + \sum_{j=p_{rp}+1}^{p_{rp}+p_m} \beta_j M_{ij} + \sum_{j=p_{rp}+p_m+1}^{p_{rp}+p_m+p_c} \beta_j C_{ij} + \sum_{j=p_{rp}+p_m+p_c+1}^{p} \beta_j P_{ij}$$

Where:

p is the probability of having a managed care contract, accepting capitation, or participating in Medicare and Medicaid;

RP is a vector of relative price variables;

M is a vector of market characteristics;

C is a vector of practice characteristics; and

P is a vector of physician characteristics.

Logistic regression using maximum likelihood estimation is used to estimate the effect of the independent variables on that probability. The resulting β coefficients, or log-odds, may then be transformed into odds ratios by taking e^{β}. For dichotomous variables, an odds ratio provides a measure of the relative likelihood that a physician with a given characteristic (e.g., being board certified) is also positive on the response variable (e.g., has a managed care contract) versus a physician without that characteristic (e.g., not being board certified). For continuous variables, an odds ratio provides a measure of the increase (decrease) in the relative likelihood of being positive on the response variable for every unit of increase (decrease) in the explanatory variable.

Analysis of continuous outcome variables

For the second stage of analysis, that is, the analysis of continuous outcome variables, conventional OLS regression techniques were used. The continuous outcome variables are: the percentage of revenues from managed care, the percentage of managed care revenues from capitation, and the percent of the patient load from each public sector program, Medicare and Medicaid.

Analysis of multinomial outcome variables

For the PLR/ML analyses, the physician faces more than two choices, so polytomous logistic regression (multinomial logit regression) is appropriate (Agresti 1984; Hosmer and Lemeshow 1989; Frank and Kamlet 1989). The assumption underlying the model is that the physician chooses among the available options based on the utility of each alternative. S/he chooses the option that maximizes his/her utility. The utility of choice option k to individual i, U_{ijk}, can be modeled as:

$$U_{ijk} = U\ (RP_{ijk}, M_{ijk}, C_{ijk}, P_{ijk})$$

where:

RP is a vector of relative price variables;

M is a vector of market characteristics;

C is a vector of practice characteristics; and

P is a vector of physician characteristics.

Assuming that physicians maximize their utility from the set of choices facing them, each physician will choose an alternative *k* only if $U_{ijk} > U_{ijm}$ for all m not equal to k. The probability of choosing alternative k is then $\Pr(U_{ijk} > U_{ijm})$. Note that this analysis simplifies to ordinary logistic regression in the case of a binary outcome. Assuming a linear function,

$$U_{ijk} = \beta_{jk} X_{ijk} \text{ ,}$$

the probability of choosing each option is:

$$\Pr(Y = k \mid X_{ij}) = e^{\beta_{jk} X_{ijk}} / \sum_{k=0}^{m} e^{\beta_{jk} X_{ijk}}$$

for all k;

where β_{jk} is a vector of coefficients indicating the effect of X_{ijk} on the individual physician's utility for option *k*.

The coefficients are estimated by taking the logit for each alternative k and solving m-1 simultaneous equations, with one outcome specified as the comparison group. The β coefficients are interpreted as in simple logistic regression, except that they refer to the probability of k compared to the reference group. Note that one variable x_j, may have a different effect on each alternative choice. That is, β_j in equation 1 may not

equal β_j in equation 2. Assessing the effects of an explanatory variable across equations can be done by subtracting the beta-coefficients for that variable in each equation.

Model Specification and Model-Building Strategies

Similar model-building techniques were used for all of the dependent variables. First, bivariate analyses were conducted to identify relationships between the dependent and independent variables defined in the model. Then, all of the independent variables were included in the model. Exploratory analysis was conducted of plausibly important interaction terms. A list of possibly interesting interactions was constructed for each pair of outcome variables in the two-stage analysis. To ensure the stability of the regression coefficients, only those interactions that had a cell size of at least 50 members were tested, using a step-wise selection process. To avoid a multiple comparisons problem, a modified Bernoulli correction was used ($p<=.01$). This procedure resulted in no interactions that were consistently of both substantive and statistical significance.

Summary goodness-of-fit measures were used to assess the models, including the coefficient of determination (adjusted r-square) for the OLS regressions, and the generalized coefficient of determination (quasi-rsquare) and Hosmer-Lemeshow goodness-of-fit test for logistic regressions. For the polytomous logistic regressions, each equation in each model was also evaluated as a binomial logistic regression of that outcome against the reference group for diagnostic purposes. The same summary goodness-of-fit measures were used to evaluate these regressions. In addition, residual

plots were used to assess the fit of each model and to check for heteroskedasticity, both overall and for each of the continuous dependent variables.

Where the plots indicated a general lack of fit (e.g., percent of revenues from capitation), transformations of the dependent variable were assessed. Where the plots indicated that a continuous variable may have a non-linear conditional relationship with a dependent variable, the continuous variable was re-specified as a set of categorical dummy variables. The pattern exhibited by the coefficients of the dummy variables was examined to determine the shape of the relationship. Residual plots were also examined to note departures from linearity. Quadratic relationships were found to be appropriate in a few places. Care was taken to avoid over-fitting the model by ensuring that no individual observations had undue influence on the functional form and by limiting the number of categorical variables.

Collinearity can be an issue in both OLS and logistic regression. To assess collinearity, bivariate inspection of relationships among the independent variables included pearson correlation coefficients for continuous variables, odds ratios for nominal variables, and two-sample t-tests of means for the value of continuous variables across nominal variables. In the OLS regressions, tolerance tests were performed. In accordance with Menard (1995), tolerance tests were also performed on the logistic models, as this approach is sufficient for diagnostic purposes when looking at continuous explanatory variables. The effect of collinearity on the regression estimates was also assessed by evaluating models with and without each of the collinear terms.

Examining the odds ratios for each practice size dummy versus ownership status, the variable OWN and the practice size variables were found to be highly correlated. In addition, physicians who were institutional employees could not, by definition, have an ownership interest in their practice. Three different model specifications were tested: (a) including both OWN and the practice size variables; (b) including only OWN; and (c) including only the practice size variables. While the practice size variables had consistent, significant coefficients, the coefficient for OWN was not stable. As a result, OWN was not included in the final model, although this variable is a part of the conceptual model presented in Chapter 3. See Appendix 5 for the odds ratios of the ownership and practice size variables, and a comparison of the 3 alternative model specifications for logistic regression of managed care contracting (MCCONT). The bivariate inspection and tolerance tests indicated that none of the other variables were excessively collinear.

Endogeneity. In the economics literature, endogeneity is frequently cited as an issue in model specification. An independent variable is considered endogenous if it is correlated with the error term, thereby violating the assumption that the error terms are identically and independently distributed and leading to inefficient and inconsistent estimates. Variables may be endogenous because they are jointly determined with the dependent variable, or because of selection effects (Newhouse and McClellan 1998; Greene 1997).

In this analysis, the variable most likely to be endogenous is the percent of the physicians' patients that are uninsured (PATUN), due to selection effects. There may an unobserved characteristic of a physician with a large number of uninsured patients that is also correlated with the dependent variables. Thus, in looking at the percent of patients that are Medicaid beneficiaries (PMCAID), there may be an unobserved variable that is related to both PATUN and PMCAID. Thus, PATUN is actually estimating the effect of this unobserved variable rather than its own direct effect. One potential unobserved variable might be a belief about the role of medicine in society. For example, physicians with large percentages of uninsured patients and Medicaid patients might believe that medicine should serve those most in need: those who are vulnerable, either due to their poverty (Medicaid receipt is a proxy for this) or their lack of insurance against the financial costs of medical care. Physicians who do not have this belief about their responsibilities are less likely to accept either Medicaid patients or uninsured patients. In regards to managed care contracting, such a belief may lead physicians away from managed care, to the extent that MCOs are seen as introducing profit motives into medicine. In this analysis, however, PATUN is used as a proxy for such a belief (altruism). It is actually the effect of this potentially unobservable, and hence unobserved, variable that is being measured.

Even if PATUN is an endogenous variable, standard approaches to fixing this specification error rely on the use of instrumental variables. Given data limitations, an adequate instrumental variable is difficult to obtain. First, PATUN is a highly skewed variable, which means it must be transformed before it is estimated, which makes

interpretation awkward. Second, exploratory analysis indicated that regression models of ln(PATUN) did not result in r-square values above 0.16. Using inaccurate instrumental variables will lead to inefficient estimates. Furthermore, it might be difficult to satisfy the necessary assumption that the instrumental variables, which included provision of charity care and hours of free care, are not themselves related to the outcome variable.

In looking at the continuous outcome variables, PATUN might be endogenous in evaluating the percent of revenues from managed care because of joint determination. That is, having a large percent of revenues from managed care might constrain total revenues (assuming managed care pays less than indemnity, which is the general claim) and make it less possible to accept the financial risks of having uninsured patients. Similarly, deciding to have a large number of uninsured patients may curtail a physician's choice to have many managed care patients because they need to have higher reimbursement rates from insured patients to effectively cross-subsidize the uninsured. Or, as I have set up my model, PATUN may be a proxy for a belief about the medical system: altruism. Altruistic physicians are likely to have more uninsured patients. They are also less likely to have considerable revenues from managed care, assuming they perceive the managed care market to be profit-driven. Again, is PATUN an endogenous variable or a proxy? Given these questions about both the extent of the endogenous nature of PATUN and the lack of good instrumental variables, PATUN is used in the model directly.

Chapter 5. Two-Stage Analyses and Results

Univariate findings for dependent and independent variables are shown below. Then, the findings from two-stage multivariate analyses of physician participation are discussed for: (a) managed care contracting; (b) capitation (c) Medicare; and (d) Medicaid.

Univariate statistics

Dependent variables. As shown in Table 5.1, the majority of physicians (78 percent) had at least one managed care contract (MCCONT) in 1994. On average, physicians with managed care contracts derived 34 percent of their revenues from managed care (MCREV), with a standard deviation of 23.2. Physicians ranged from 0 to 100 percent of revenues from managed care, with a median value of 30 percent. A much smaller share of physicians (27 percent) reported having at least one capitated contract (CAPIT). Physicians with at least one capitated contract received an average of 42 percent of all managed care revenues (18 percent of all revenues) through capitation (CAPREV), with a standard deviation of 35.5. The range of CAPREV is 1 to 100 percent, with a median value of 30 percent.

Most physicians (87 percent) had provided services to Medicare beneficiaries in the previous 12 months (DMCARE). Approximately one-third of these physicians' patients (35 percent) were covered by Medicare (PMCARE), with a standard

deviation of 34.9. The percent of a physician's patients covered by Medicare ranged from 0 to 100, with a median value of 30 percent. Although a large share of physicians (84 percent) reported providing Medicaid services in the previous 12 months (DMCAID), the average percent of patient load covered by Medicaid (PMCAID) was low, 16.5 percent, with a standard deviation of 19.1. The Medicaid patient load ranged from 1 to 100, with a median value of 10 percent.

Independent variables. Table 5.1 also provides the weighted mean values for the four categories of independent variables used in the analysis: relative prices, and physician, practice, and market characteristics. In comparison to national averages for patient care physicians from the AMA Masterfile for 1993, the physicians in this sample are slightly less likely to be female (14.4 percent vs. 18.3 percent nationally) and less likely to be at the extremes of the age distribution (data not shown). Regarding specialty mix, when collapsed into four categories, the sample and the AMA Masterfile have approximately equal proportions of general/family practitioners (15.9 percent in the sample vs. 12.7 percent nationally) or medical specialists (33.3 percent in the sample vs. 33.8 percent nationally). The sample contains more surgical specialists (36.5 percent in the sample versus 25.2 percent nationally) and fewer "other" specialists (15.3 percent in the sample vs. 28.3 percent nationally) than the national average. These differences may limit the external validity of the findings.

Table 5.1: Descriptive Statistics

Variable	n	mean/percent of sample	s.d.	range
Dependent Variables				
Physician has managed care contract(s) - MCCONT	2914	78.21%	0.41	0,1
Percent of revenues from managed care (MCCONT=1) - MCREV	2189	33.98%	23.17	0-100
Physician has capitated contract(s) - CAPIT	2705	26.73%	0.44	0,1
Percent of managed care revenues from capitation (CAPIT=1)-	710	41.52%	35.51	0-100
Physician provides Medicare services - DMCARE	2914	87.37%	0.32	0,1
Percent of patients covered by Medicare (DMCARE=1) - PMCARE	2505	34.94%	23.15	0-100
Physician provides Medicaid services - DMCAID	2914	84.38%	0.36	0,1
Percent of patients covered by Medicaid (DMCAID=1) - PMCAID	2447	16.48%	19.14	0-100
Independent Variables - Relative Prices				
Medicaid vs. private fees - MCDPRI	2914	59.50%	0.14	.347-.845
Medicare vs. private fees - MCRPRI	2914	78.60%	0.03	.716-.820
Physician's usual fee - FEEINDX3	2914	1.00	0.50	.061-10.13
Independent Variables - Market Characteristics (MSA Level)				
Urban residence (50,000+)	2914	86.18%	0.35	0,1
Percent of pop. in HMOs - HMOPOP	2914	25.55%	0.32	0-1
1990 Percent of pop. age 60+ - ARF65	2914	12.50%	0.03	.032-.338
1992 Per capita income ($10,000) - ARFPCI92	2914	2.177	0.59	0.98-4.92
Physician supply per 10,000 pop. - DOCPOP	2914	0.390	0.33	0.06-2.5
Independent Variables - Practice Characteristics				
Practice Size:				
Solo (ref. cat.)	1136	38.98%		0,1
2-5	820	28.14%		0,1
6-10	205	7.04%		0,1
11+	194	6.66%		0,1
Institution	559	19.18%		0,1
Multi-specialty group	2914	0.1131	0.32	0,1
Independent Variables - Physician Characteristics				
Sex (1=female) - ZSEX	2914	14.40%	0.35	0,1
Decade graduated medical school - MEYRCAT1				
Since 1980	965	33.12%		0,1
1970s	912	31.30%		0,1
1960s	668	22.92%		0,1
1950s	289	9.92%		0,1
Before 1950	80	2.75%		0,1
Specialty:				
General Practice/Family Practice (ref. cat.)	462	15.85%		0,1
Internal Medicine - SP11IM	808	27.73%		0,1
Surgery - SP11SUR	717	24.61%		0,1
Obstetrics/Gynecology - SP11OBG	238	8.17%		0,1
Pediatrics - SP11PED	261	8.96%		0,1
Psychiatry - SP11PSY	234	8.03%		0,1
Other - SP11OTH	194	6.66%		0,1
Board Certification Status (1=certified) - CERT	2914	79.12%	0.41	0,1
Percent of patients uninsured - PATUN3	2914	8.75%	0.12	0-1
Ownership interest in practice (1=yes) - OWN	2914	67.74%	0.47	0,1

Managed care contracting

A two-stage analysis of managed care contracting was conducted. First, logistic regression was used to look at the characteristics associated with whether or not physicians or their practices had one or more managed care contracts (MCCONT). Then, among those who did have a managed care contract, multiple linear regression was used to look at correlates of the extent of physicians' involvement with managed care, that is the percent of practice revenues derived from all managed care contracts (MCREV). Results of two regression analyses — logistic and OLS — are presented in Table 5.2. The results of the two regressions are discussed simultaneously below.

Relative prices

The ratio of Medicaid to private sector prices (MCDPRI) bears no relationship to either of the managed care contracting dependent variables. Nor does the relative value of Medicare fees (MCRPRI) have an impact on the likelihood of having a managed care contract (MCCONT). However, the ratio of Medicare to private sector prices does have a large, statistically significant, negative association with the percent of revenues from managed care (MCREV). For example, in comparing two areas in which the ratio of Medicare to private sector fees differs by 10 percent, physicians in the area with a higher ratio will have, on average, 3.6 percent less revenues from managed care. Thus, in areas where Medicare compares more favorably to the private sector, which includes managed care, there is less reliance on managed care as a source of revenue. Perhaps surprisingly,

the physician's own usual fee (FEEINDX) shows no statistically significant relationship to either of the managed care contracting variables.

Market characteristics

The market variable with the most direct relationship to managed care contracting is the rate of HMO market penetration, defined as the percent of the population in an MSA belonging to an HMO (HMOPOP). This variable represents the level of demand in the managed care sector. The association of HMOPOP with the log-odds of having a managed care contract (MCCONT) is curvilinear, with the most steeply increasing odds at lower levels of HMOPOP. Figure 5.1 graphs the odds ratio associated with a 5 percent increase in HMOPOP from a given value of HMOPOP. The conditional odds ratio associated with an increase in the percent of the population in HMOs from 0 to 5 percent is 1.13, while for an increase from 5 percent to 10 percent it is 1.11. The conditional odds ratio associated with a 5 percent increase in HMOPOP is greater than one, but decreasing in size, until HMOPOP equals 0.60[2].

This relationship may reflect a saturation point. There may be a certain percentage of physicians in every MSA that will not have managed care contracts no matter what the HMO penetration. It is also possible, however, that this is an artifact of the data. The data comes from an InterStudy survey that allocates HMO membership to

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[2] HMOPOP is scaled from 0-1. Therefore, the equation used to calculate the effect of a 5 percentage point change in HMOPOP at any given value of HMOPOP is: exp(.05*2.465 + 2*.05*-2.007*HMOPOP + .05*.05*-2.007).

the location of an HMO's headquarters, rather than the location of its members. Thus, MSAs in which national or regional HMOs are headquartered will have an inflated HMO penetration rate. Physicians' managed care contracting behavior should reflect the actual level of demand in these areas, which will be lower than that reported.

A similar relationship is seen between managed care sector demand and the percent of revenues from managed care among those with managed care contracts (MCREV, see Figure 5.2). As the HMO penetration rate increases, the percent of revenues increases, but levels off when the HMO penetration rate goes above 75 percent. The effect of the HMO penetration rate on the percent of revenues from managed care, holding all other variables constant, is 6, 10, and 12 percentage points at HMO penetration rates of .25, .50, and .75, respectively.

The demand variable for the Medicaid sector of the market (per capita income, ARFPCI) is not a significant predictor for either managed care contracting outcome. The demand variable for the Medicare sector (the percent of population that is age 65 or over, ARF65) is not a statistically significant predictor of having a managed care contract, but is associated with the percent of revenues obtained through managed care. A 5 percentage point increase in the proportion of the population that is over 65 is associated with a 3 percentage point decline in revenues from managed care. This negative association was predicted by the model because higher demand in one sector of the market implies lower relative demand in the other sectors of the market.

Physicians in urban areas are 75 percent more likely to have a managed care contract than their rural counterparts (MCCONT, OR=1.74, p<.0001). Urban physicians with managed care contracts also have, on average, 7 percent higher (p<.0001) percent of revenues from managed care (MCREV), when all other variables are held constant. This finding is the opposite of the model's predicted negative relationship, after accounting for demand in the managed care sector. It may be that urban residence is serving as a proxy for the poorly-measured HMOPOP. A strong, positive association between population size and managed care market penetration has been noted (Kronick, et. al. 1993; InterStudy 1997).

Physicians in areas with greater physician supply (MDs per 10,000 population, DOCPOP) are less likely to have managed care contracts (MCCONT, OR=0.72) and rely less on managed care as a source of income (MCREV, -7.6). This finding appears to contradict the widely held view that MCOs tend to focus on areas with high physician supply in order to benefit from competition among providers. It also contradicts the prediction of the model that physicians in more competitive markets are more likely to contract with MCOs. However, this finding may suggest that in addition to focusing on areas with large physician supply, MCOs are also more selective in their physician contracting in these areas. In areas with more physicians per capita, an MCO can contract with a smaller percentage of physicians and still offer a large panel of physicians to plan members. In areas with fewer physicians per capita, there is more pressure to contract with a larger share of physicians to ensure than enrollees have an adequate pool of providers from which to choose.

Practice characteristics

Practice size as a concept is a significant predictor of having a managed care contract (MCCONT, likelihood ratio test, p=.0001) and of the percent of physicians' revenues derived from managed care (MCREV, model F test, p=.0001). In general, the odds of having a managed care contract (MCCONT) increase with practice size. Compared to solo practice physicians, the odds ratios for those in practices with 2-5 physicians is 1.44; for practices with 6 to10 physicians, it is 1.75, and for those with 11 or more, the odds ratios is 3.26. This finding is consistent with the argument of some observers (Kletke, et. al. 1996) who suggest that managed care is one force leading physicians into larger practices. Physicians who work for institutions, not in practice settings, are less likely than those in solo practice to have managed care contracts (MCCONT, OR=.68, p<.01). Among those physicians with a managed care contract, practice size is a statistically significant predictor of the percent of revenues from managed care (MCREV) only for those working in practices with 6 to 10 physicians, who, on average, receive 5 percent less of their revenues from managed care than physicians in solo practice (p<.05).

Perhaps surprisingly, physicians working for multi-specialty group practices are less likely to have managed care contracts than other physicians (MCCONT, OR=.624, p<.05). Data from California indicates that multi-specialty groups are emerging as a primary organizational tool for contracting (Robinson and Casalino 1995). However, these data, which are from an earlier year and national in scope, do not confirm that trend.

Physician characteristics

Certain characteristics of the individual physician are associated with the likelihood of having a managed care contract (MCCONT) and the percent of revenues from managed care contracts (MCREV). For example, more recent graduates from medical school are more likely to have managed care contracts (MCCONT). Each decade of experience has an odds ratio of 0.77. Thus, physicians graduating in the 1960s are 23 percent less likely to have a managed care contract than those graduating in the 1970s and 46 percent less likely to have a contract than those graduating since 1980. Since older patients tend to see older physicians, this finding may be of concern as more Medicare beneficiaries join managed care plans. Older patients may find they can no longer see their usual physicians, disrupting continuity ("longitudinality") of care (Weiss and Blustein 1996). Among physicians who have a managed care contract, however, years of experience do not have a statistically significant effect on the percent of revenues from managed care (MCREV).

Internists, surgeons and pediatricians are no more or less likely than general/family practitioners to have a managed care contract (MCCONT). Psychiatrists and "other" specialists, however, are less likely to have a managed care contract (OR=.42, $p<.001$ and OR=.48, $p<.001$, respectively), while obstetrician-gynecologists are 50 percent more likely to have managed care contracts (OR=1.49, $p<.05$). With regard to the percent of revenues from managed care (MCREV), there is no statistically significant difference between pediatricians and general/family practitioners. Obstetrician-gynecologists obtain, on average, 6 percent more of their revenues from managed care

than general/family practitioners. In descending order, surgeons, psychiatrists, other specialties, and internists receive a smaller share of revenues from managed care than general/family practioners. These findings indicate that while managed care contracting (MCCONT) is fairly evenly spread by specialty, the reliance on managed care as a source of revenue (MCREV) varies by specialty and is generally higher among primary care physicians (including pediatricians and obstetrician-gynecologists) than specialists.

Board certified physicians (CERT) are more than twice as likely as non-certified doctors to have managed care contracts (MCCONT, OR=2.3, p<.0001). Among those with contracts, however, certification is not a significant predictor of the percent of revenues from managed care (MCREV). This finding validates the claim that managed care companies use certification as a criterion for including physicians in their network. While this can be seen as a measure of quality of care (Gold, et. al. 1995), it may also lead to discrimination against female, minority, and older physicians, who are less likely to be board certified (Bindman, et. al. 1998; Ohsfeldt, et. al. 1998). In the SMS sample, the difference in certification by decade of graduation from medical school is large. Of those graduating since 1970, 86.6 percent obtained certification, while among those graduating before 1970, only 76.6 percent are certified (p=.0001). Male physicians are slightly more likely than females to be certified (83.5% vs. 80.2%, p=.05). Unfortunately, no information concerning race is provided in the dataset to preserve confidentiality.

While female physicians are no more or less likely than their male counterparts to have a managed care contract (MCCONT), after controlling for other factors such as age and specialty, among those who have contracts, women derive almost 5 percent more of their revenues from managed care (MCREV).

The percent of patients that are uninsured (PATUN) is used as a proxy for altruism. As predicted by the model, physicians in practices with more uninsured patients are less likely to have managed care contracts (MCCONT). A five percentage point increase in the percent of patients uninsured is associated with a 23 percentage point decrease in the odds of having a managed care contract (OR=.77, $p<.0001$). Among those with managed care contracts, a five percentage point increase in PATUN is associated with 0.75 percentage points less income derived from managed care (MCREV, $p<.0001$). This finding is in part driven by definition: the pool of patients in a practice is made up of those with coverage from managed care or traditional indemnity insurance, and those who are uninsured. As the number covered by managed care increases, the number covered by other insurers and/or the number of those uninsured must decrease. However, recent years have experienced increases in the number of uninsured individuals in the health care system as a whole (Bennefield 1998). Thus, this finding is consistent with concerns that participation in managed care is leading physicians to provide fewer services to the uninsured (Cunningham 1999).

Summary

In many ways, these findings follow the conceptual model presented in chapter 3. Economic forces appear to be at work. Physicians are less involved with managed care in areas where Medicare has higher fees relative to the private sector, and managed care contracting is more prevalent in areas with greater demand in the managed care sector. Contrary to the predictions of the conceptual model, physicians in areas with a greater number of physicians per capita are less likely to have managed care contracts. One interpretation of this finding is that MCOs are more selective in those markets.

Many of the practice and physician-level results are also consistent with the conceptual model. The odds of having a managed care contract increase with practice size. Primary care physicians participate more fully than specialists. Certified physicians are more likely to participate in the managed care sector. More experienced physicians, in contrast, are less likely to have managed care contracts. Altruistic physicians are less likely to participate in the managed care sector. Some of these findings, particularly those related to years of experience, gender, and certification, are consistent with concerns over physicians' access to the managed care market and the criteria used to include physicians. Given the cross-sectional nature of the data, this study cannot assess whether these differences are due to MCO selection criteria or physician choice. It does, however, suggest that further research regarding the impact of selective contracting is warranted. The findings regarding the percent of uninsured patients should raise concerns about the ability of the managed care sector to care for the uninsured.

Table 5.2 Regression Results for Managed Care Contracting

Variable (Name)	Has Managed Care Contract (MCCONT) coeff.	s.e.	O.R.	Percent Revenues From Managed Care (MCREV) coeff.	s.e.
Comparative Fee Information					
Medicaid vs. private fees - MCDPRI (a)	0.117	0.400	1.125	-1.117	3.920
Medicare vs. private fees - MCRPRI (a)	0.767	1.585	2.153	-36.377 **	14.868
Physician's usual fee - FEEINDX (a)	0.199	0.118	1.220	1.010	0.987
Market Characteristics (MSA Level)					
Urban residence (50,000+) - URBAN	0.556	0.174	1.744 ***	6.863 ***	1.939
Percent of pop. in HMOs - HMOPOP (b)	2.465	0.586	11.761 ***	28.229 ***	5.232
Percent of pop. in HMOs squared - HMOPOPSQ (b)	-2.007	0.599	0.134 ***	-16.174 **	5.349
1990 Percent of pop. age 65+ - ARF65 (b)	0.948	1.483	2.580	-66.715 ***	14.618
1992 Per capita income ($10,000) - ARFPCI92	-0.126	0.103	0.882	-1.676	1.042
Physician supply per 10,000 pop. - DOCPOP	-0.326	0.160	0.722 *	-7.646 ***	1.939
Practice Characteristics					
Practice size (solo is reference):					
2-5 - N2TO5	0.361	0.135	1.435 **	-2.037	1.181
6-10 - N6TO10	0.558	0.257	1.747 *	-4.728 *	1.953
11+ - N11PLUS	1.180	0.331	3.255 ***	3.261	2.532
Works for an institution - NINST	-0.380	0.135	0.684 **	-1.947	1.469
Multi-specialty group - MULTI	-0.471	0.225	0.624 *	2.531	2.015
Physician Characteristics					
Sex (1=female) - ZSEX	-0.223	0.143	0.800	4.758 ***	1.444
Decade graduated medical school - MEYRCAT1	-0.265	0.047	0.767 ***	-0.638	0.477
Specialty (general/family practice is reference):					
Surgery - SP11SUR	-0.068	0.166	0.934	-4.188 **	1.572
Internal medicine - SP11IM	-0.256	0.161	0.774	-8.531 ***	1.545
Obstetrics/gynecology - SP11OBG	0.396	0.241	1.486 *	5.914 **	1.959
Pediatrics - SP11PED	-0.120	0.212	0.887	1.275	2.014
Psychiatry - SP11PSY	-0.866	0.199	0.421 ***	-6.919 **	2.297
Other - SP11OTH	-0.730	0.216	0.482 ***	-6.145 **	2.330
Board certification status (1=certified) - CERT	0.851	0.111	2.342 ***	0.625	1.293
Percent of patients uninsured - PATUN (b)	-2.868	0.390	0.057 ***	-14.997 **	5.214
Intercept	0.4001	1.431		71.825	13.786
Hosmer-Lemeshow goodness-of-fit test (p-value)	0.454				
R-Square/Pseudo r-square	0.205			0.131	

* Statistically significant at the .05 level.

** Statistically significant at the .01 level.

*** Statistically significant at the .001 level.

(a) These variables are percentages scaled from 0-1. The odds ratio for a 10 percentage point change is:

	MCCONT
MCDPRI	1.012
MCRPRI	1.080
FEEINDX	1.020

(b) These variables are percentages scaled from 0-1. The odds ratio for a 5 percentage point change is:

PATUN	0.866	
HMOPOP	0.995	(includes square term; change from 0-.05)
ARF65	1.049	

Figure 5.1 Conditional Relationship Between Managed Care Contracting (MCCONT) and HMO Market Penetration (HMOPEN)

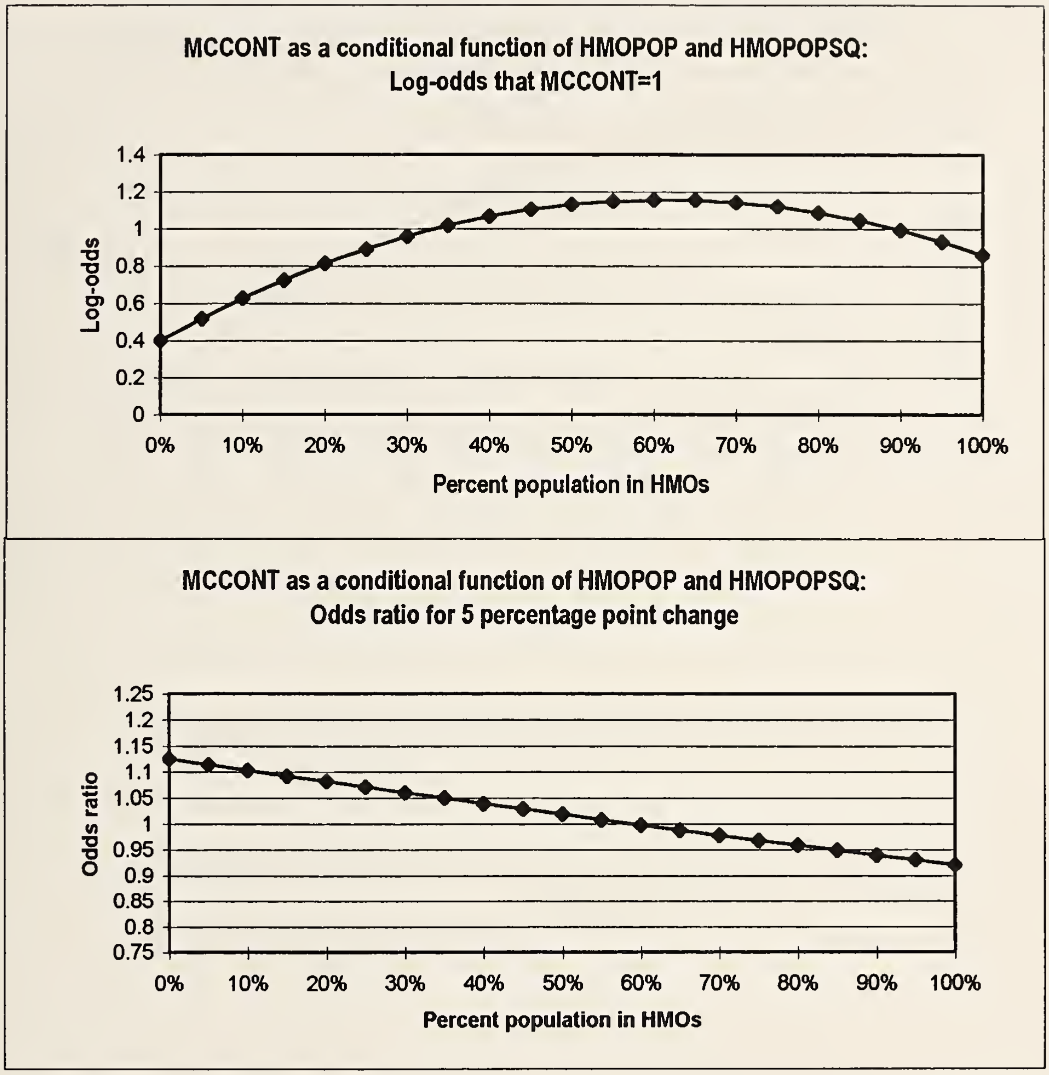
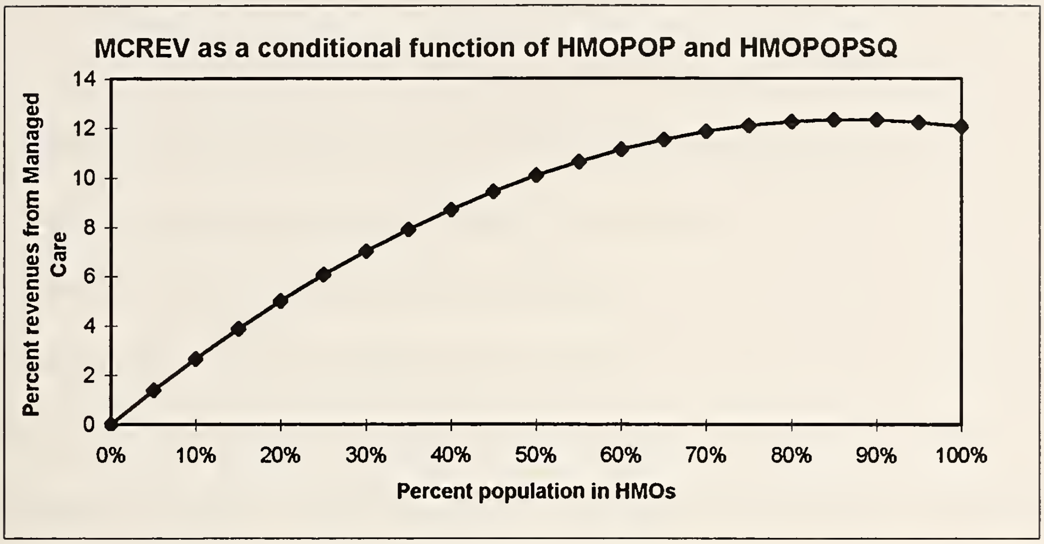


Figure 5.2 Conditional Relationship Between Percent Revenues From Managed Care (MCREV) and HMO Market Penetration (HMOPEN)



Capitation

As with managed care contracting, a two-stage analysis of capitation arrangements was conducted. First, logistic regression was used to look at the characteristics associated with whether or not a physician or his/her practice had capitated contract(s). Then, among those who did accept capitation, multiple linear regression was used to look at correlates of the extent of a physician's involvement with capitation — that is, the percent of all managed care revenues that are capitated. Results of two regression analyses — logistic and OLS — are presented in Table 5.3. The findings from both analyses are discussed simultaneously below.

The analysis of the percent of managed care revenues that are capitated (CAPREV) presents a number of challenges. First, the r-square indicates that less than 7 percent of the variation in the outcome variable is explained by the model. In addition, only four independent variables have coefficients that are statistically significant at standard levels. Thus, while there are variables associated with having capitated contracts, they have little explanatory value regarding the importance of capitation as a source of revenues.

Alternative model specifications resulted in little improvement in the explanatory value. Given the skewed nature of this dependent variable, the model was also fit using a natural log transformation of CAPREV (LNCAPREV). This model had similarly low explanatory power (r-square=.06). Given that the central limit theorem assures approximate coefficient normality for analyses of large samples, the results of the

untransformed CAPREV model are presented here. Results of the LNCAPREV model are included in Appendix 6. The findings regarding the direction of effect and level of significance were almost identical in both models. However, the coefficient for board certification status did not reach conventional levels of significance in the model of LNCAPREV, although the direction of the effect was the same in both models.

One reason for the low explanatory power may be the apparent lack of knowledge on the part of physicians about specific reimbursement arrangements, such as capitation. In the analytic sample, 7.2 percent of physicians did not know whether or not they had any revenues from a capitated contract. This level of uncertainty may be a reflection of the early stage of development of capitation as a widely-used payment method, and the slow diffusion of knowledge and practice about capitation. Other analysts have reported similar findings (Simon and Emmons 1997, Project HOPE 1995); more robust data do not seem to be available at this point in time. Given the questionable reliability of the dependent variable and low explanatory power of the independent variables, the results reported here should be regarded as preliminary.

Relative prices

Among physicians with a managed care contract, those with higher standard fees relative to others in his/her specialty (FEEINDX) are less likely to have a capitated contract (CAPIT). On average, a 10 percent difference in fees leads to a 3 percent decline in the probability of having a capitated contract (OR=.97, p<.01). There is no association with between the physician's usual fee and the percent of managed care

revenues that are capitated (CAPREV). The other relative price variables are associated with neither the probability of having a capitated contract (CAPIT) nor the percent of managed care revenues that are from capitated contracts (CAPREV).

Market characteristics

As the conceptual model predicts, physicians in areas with a higher HMO market penetration rate (HMOPOP) sign capitated contracts (CAPIT) more frequently. A physician in an area with 20 percent of the population in HMOs will, on average, be 2 percent more likely to have a capitated contract than a similar physician in an area with only 15 percent of the population in HMOs. Thus, the level of demand for physicians in the managed care sector affects the likelihood of having a capitated contract. However, HMO market penetration shows no relationship to the extent of a physician's involvement with capitation (CAPREV).

Regarding other market variables, physicians in urban areas (URBAN) are more likely to have capitated contracts than their rural counterparts (OR=1.7 $p<.01$). Among those with capitated contracts, however, urban residence has no effect on CAPREV. Other market-level measures show no association with the capitation outcomes, with one exception. Capitated physicians in areas with greater physician supply (DOCPOP) receive, on average, a lower percentage of their managed care revenues (CAPREV) through capitated contracts ($p<.05$). Thus it appears that, contrary to the model, competition among physicians has no effect on the probability of having a capitated

contract (CAPIT). However, in areas with more physicians per capita, physicians derive a smaller percent of managed care revenues from capitation.

Practice characteristics

The conceptual model predicts a positive association between practice size and capitation. Physicians in small to medium-size practices (N2TO5, N6TO10) are no more or less likely than solo physicians to be capitated (CAPIT); however, those in large groups (N11PLUS) are more than twice as likely as those in solo practice (OR=2.1, p<.01) to be capitated. Physicians working for institutions (NINST) are 65 percent more likely than solo practice physicians to be in settings where managed care contract(s) are capitated (OR=1.65, p<.001). Similar results are found for the percentage of managed care revenues capitated (CAPREV): those in large groups (N11PLUS) receive 14 percent more of the managed care revenues from capitated contracts than those in solo practice (p=.02). Those working for institutions (NINST) receive 16 percent more of their managed care revenues through capitation (p=.0001).

As predicted by the model, physicians in multi-specialty groups are more than twice as likely as those in other practice settings to be capitated (CAPIT, OR=2.06, p<.001). Among those with a capitated contract, however, no difference is seen in the percent of managed care revenues that are derived from capitated contracts (CAPREV).

Physician Characteristics

To a large degree, the findings regarding physician characteristics are consistent with the model. As predicted by the model, more experienced physicians are less likely to be capitated (CAPIT, OR=.899, p<.05). However, no statistically significant difference emerges in the extent of involvement with capitation by years of experience (CAPREV). All specialties are less likely than general/family practice to be capitated (CAPIT). In descending order, the relative odds are: pediatricians (OR=.71, n.s.), internists (OR=.42, p<.001), obstetrician-gynecologists (OR=.32, p<.001), other specialties (OR=.25, p<.001), surgeons (OR=.18, p<.001), and psychiatrists (OR=.14, p<.001). Specialty, however, shows no relationship to the percent of managed care revenues that are capitated (CAPREV).

Contrary to the conceptual model, among physicians with managed care contracts, board certified physicians (CERT) are less likely to have capitated contracts (CAPIT) than those without certification (OR=.75, p<.05). Board certified physicians also receive a smaller percent of their managed care revenues through capitation, although this variable was not significant in the model of the log-transformation of CAPREV. While female physicians were no more or less likely than their male counterparts to have capitated contracts, those with capitated contracts received about 8 percent less of their managed care revenues from them (p<.05). No relationship was found between physician altruism (PATUN) and capitation arrangements.

Summary

The models of participation in capitation arrangements have low explanatory power; as a result the findings should be interpreted as preliminary. Nevertheless, the analysis suggests that, to some extent, market forces are at work. Physicians in areas with greater HMO market penetration are more likely to have a capitated contract. Contrary to the predictions about competition, however, higher physician supply is associated with lower percent of managed care revenues from capitation. The findings regarding physician specialty, and practice size and type are as predicted. General/family practitioners are more likely than specialists to be capitated. Those in large and multi-specialty groups, and those working for institutions, are more likely to participate in capitation arrangements than those in solo or small-group practices. Physicians in large- and medium-size groups also derive a larger percentage of their managed care revenues from capitated contracts. A number of findings suggest that capitation is more likely among those who are less well established, and therefore more likely to accept the increased risks inherent in capitation. Physicians with higher fees in comparison to others in his/her specialty are less likely to be capitated; it seems likely that those with higher fees are more established. Uncertified physicians are more likely to have capitated contracts, as are physicians with less experience.

Table 5.3 Regression Results for Participation in Capitation Arrangements

Variable (Name)	Has Capitated Contract (CAPIT) coeff.	s.e.	O.R.	Percent Managed Care Revenues From Capitation (CAPREV) coeff.	s.e.
Comparative Fee Information					
Medicaid vs. private fees - MCDPRI (a)	-0.387	0.419	0.679	-16.444	11.295
Medicare vs. private fees - MCRPRI (a)	-1.800	1.588	0.165	26.817	40.304
Physician's usual fee - FEEINDX (a)	-0.329	0.129	0.72 **	-2.290	3.678
Market Characteristics (MSA Level)					
Urban residence (50,000+) - URBAN	0.548	0.211	1.729 **	-11.999	5.517
Percent of pop. in HMOs - HMOPOP (b)	0.418	0.177	1.519 *	7.692	4.452
1990 Percent of pop. age 65+ - ARF65 (b)	-1.599	1.638	0.202	32.498	41.114
1992 Per capita income ($10,000) - ARFPCI92	-0.065	0.115	0.937	-1.193	3.246
Physician supply per 10,000 pop. - DOCPOP	-0.125	0.218	0.882	-11.071 *	5.556
Practice Characteristics					
Practice size (solo is reference):					
2-5 - N2TO5	-0.051	0.129	0.951	-4.443	3.552
6-10 - N6TO10	0.249	0.203	1.282	-0.329	5.297
11+ - N11PLUS	0.741	0.261	2.097 **	13.833 *	5.813
Institutional employee - NINST	0.500	0.155	1.648 ***	16.139 ***	3.996
Multi-specialty group - MULTI	0.721	0.202	2.057 ***	8.152	4.552
Physician Characteristics					
Sex (1=female) - ZSEX	0.238	0.152	1.269	-7.690 *	3.632
Decade graduated medical school - MEYRCAT1	-0.126	0.051	0.882 **	-1.137	1.362
Specialty (general/family practice is reference):					
Surgery - SP11SUR	-1.705	0.170	0.182 ***	4.142	4.352
Internal medicine - SP11IM	-0.864	0.158	0.422 ***	1.502	3.596
Obstetrics/gynecology - SP11OBG	-1.143	0.205	0.319 ***	4.542	5.228
Pediatrics - SP11PED	-0.346	0.202	0.707	2.447	4.550
Psychiatry - SP11PSY	-1.936	0.280	0.144 ***	11.437	8.145
Other - SP11OTH	-1.401	0.248	0.246 ***	-0.672	6.523
Board certification status (1=certified) - CERT	-0.287	0.136	0.751 *	-7.849 *	3.459
Percent of patients uninsured - PATUN (b)	0.117	0.544	1.124	-12.161	12.595
Intercept	2.342	1.472		47.352	38.504
Hosmer-Lemeshow goodness-of-fit test (p-value)	0.945				
R-Square/Pseudo r-square	0.183			0.067	

* Statistically significant at the .05 level.

** Statistically significant at the .01 level.

*** Statistically significant at the .001 level.

(a) These variables are percentages scaled from 0-1. The odds ratio for a 10 percentage point change is:

	CAPIT
MCDPRI	0.962
MCRPRI	0.835
FEEINDX	0.968

(b) These variables are percentages scaled from 0-1. The odds ratio for a 5 percentage point change is:

PATUN	1.006
HMOPOP	1.021
ARF65	0.928

Serving Medicare patients

A two-stage analysis of the correlates of serving Medicare patients was conducted. First, logistic regression was used to analyze the characteristics associated with whether or not a physician provides Medicare services (DMCARE). Then, among those who do, multiple linear regression (OLS) was used to look at correlates of the extent of the physician's participation with Medicare; that is, the percent of his/her patients whose primary insurance coverage was Medicare (PMCARE). Results of the two regression analyses are presented in Table 5.4; they are discussed simultaneously below.

Relative prices

As predicted by the conceptual model, the ratio of Medicare prices to private sector prices (MCRPRI) was positively related to physician participation with the Medicare program. Although the results from the logistic regression are not statistically significant, they are in the right direction: a 10 percentage point difference in MCRPRI is associated with a 34 percent difference in the likelihood of having served Medicare patients (DMCARE). The same 10 percentage point difference in MCRPRI is associated with an increase of 2.5 percentage points in the percent of patients that are Medicare beneficiaries (PMCARE, $p<.05$). Interestingly, the relative price level for Medicaid fees (MCDPRI) is also positively associated with PMCARE, but with a smaller effect than the relative Medicare fees. This may indicate that physicians provide services to more patients that are eligible for both Medicare and Medicaid (so-called "dual-eligibles") in

areas with higher relative Medicaid patients. A physician's own usual fee (FEEINDX) has no relationship to either of the Medicare outcomes.

Market characteristics

The level of demand for Medicare services, as measured by the percent of the population age 65 and over (ARF65), is strongly associated with both of the Medicare outcomes. A physician working in an area in which the elderly make up 5 percent more of the population than the area in which a similar physician works is, on average, 33 percent more likely to have provided Medicare services (DMCARE, OR=1.33, $p<.05$), and will have 6.4 percentage points more Medicare beneficiaries in his/her practice (PMCARE). The level of demand for managed care (HMOPOP) and Medicaid (ARFPCI) are negatively associated with PMCARE. These findings are consistent with the model and economic theory. The level of competition among physicians, as measured by the number of physicians per 10,000 population (DOCPOP), and population size (URBAN) are not statistically significant predictors of participation in Medicare.

Practice characteristics

As predicted by the model, no statistically significant relationship emerges between practice size and Medicare participation. However, physicians working in an institutional setting are less likely than physicians working in other practice settings to provide Medicare services (DMCARE, OR=.63, $p<.05$). This may reflect the restricted patient base of some of these institutions, such as a local government health department

or a university student clinic. Working in a multi-specialty group practice bears no statistically significant association to the Medicare outcomes.

Physician characteristics

Specialty as a concept is a statistically significant predictor of providing Medicare services (LRT, p=.0001) and of the percent of patients covered by Medicare (model f test, p=.0001). The findings by specialty are consistent with what might be expected. Compared to general and family practice physicians, pediatricians (OR=.008, p<.001) obstetrician-gynecologists (OR=.408, p<.001), psychiatrists (OR=.324, p<.001), and "other" physicians (OR=.206, p<.001) are less likely to provide Medicare services. No specialties are more likely to provide Medicare services than general and family practitioners; no statistically significant difference is found between surgeons, internists, and general/family practitioners. With regard to the percentage of patients covered by Medicare among those who provide Medicare services, a statistically significant, negative association was found for obstetrician-gynecologists (-17.8, p<.001), pediatricians (-13.6, p<.001), and psychiatrists (-3.7, p<.05). Statistically significant, positive associations with the percent of patients covered by Medicare were found for internists (17.4, p<.001), surgeons (8.0, p<.001), and "other" physicians (6.1, p<.001).

Decade of graduation from medical school has no effect on the odds of providing Medicare services. However, those with more experience are likely to have a higher percentage of Medicare patients (for each decade, 2.5 percentage points, p=.0001). Therefore, physicians graduating in the 1960s have, on average, 2.5 percent more

Medicare recipients in their practice than those graduating in the 1970s, and 5 percent more than those graduating since 1980. Coupled with the results presented above that suggest older physicians are less likely to contract with managed care, these findings indicate that access to usual sources of care may be a problem as more Medicare beneficiaries sign up with Medicare managed care plans.

Female physicians are less likely to provide Medicare services than their male counterparts, even after controlling for years of experiences and specialty (OR=.69, p<.05). Among those doctors that do provide Medicare services, women have a lower percentage of Medicare patients (-3.3, p<.01). Controlling for specialty and age is important because women are more likely to be pediatricians and obstetrician-gynecologists, who tend to see younger patients, and to have finished their training more recently. This remaining gender disparity may reflect the preferences of Medicare beneficiaries.

Board certified physicians are twice as likely as non-certified doctors to provide Medicare services (OR=1.98, p<.001). Physicians who provide Medicare services do not differ in the percent of their practice made up of beneficiaries by certification status.

The percent of uninsured patients in a physician's practice is a statistically significant predictor of both Medicare outcomes. Those with more uninsured patients are less likely to provide Medicare services (a 5 percentage point difference is associated with decrease in odds of 11 percent; OR=.89, p<.001). Among those providing Medicare

services, a 5 percentage point difference in the percent of uninsured patients is associated with about 1 percent fewer patients covered by Medicare ($p<.001$). This finding suggests that physicians with a strong belief in the social role of medicine do not consider Medicare beneficiaries as a vulnerable population, perhaps because they have fairly extensive insurance coverage through the program.

Summary

The relatively high values of pseudo-rsquare and r-square for the analysis of participation in Medicare (.52 for DMCARE and .29 for PMCARE) suggest that the model explains a fair amount of the variation in participation with Medicare. As predicted by the conceptual model, prices play a role in physician participation with Medicare. Physicians are more likely to participate in areas where Medicare fees are higher relative to the private sector. This is also true in areas where the Medicaid fees are higher relative to the private sector, perhaps as a reflection of physician treatment of dual-eligibles. Increases in demand for Medicare services (ARF65) lead to greater participation with Medicare; greater demand in other sectors (HMOPOP, ARFPCI) are associated with lower levels of Medicare participation. Also as predicted, practice characteristics have no relationship to Medicare participation, with the exception of physicians working for institutions, who are less likely to participate. This may be a reflection of the patient pool of the institutions (e.g., students). The findings were also as expected for physician specialty — those most in demand for the Medicare population are most likely to participate. Finally, more experienced physicians tend to have more Medicare patients. They are also less likely to participate in managed care arrangements.

These finding suggest that as more Medicare beneficiaries move into managed care, their usual source of care may be threatened.

Table 5.4 Regression Results for Medicare Participation

Variable (Name)	Provides Medicare Services (DMCARE) coeff.	s.e.	O.R.	Percent of Patients Medicare Beneficiaries (PMCARE) coeff.	s.e.
Independent Variables - Comparative Fee Information					
Medicaid vs. private fees - MCDPRI (a)	0.058	0.633	1.060	7.048 *	3.200
Medicare vs. private fees - MCRPRI (a)	2.894	2.522	18.059	24.599 *	12.545
Physician's usual fee - FEEINDX (a)	-0.025	0.155	0.975	-0.435	0.786
Independent Variables - Market Characteristics (MSA Level)					
Urban residence (50,000+) - URBAN	-0.377	0.336	0.686	-1.409	1.476
Percent of pop. in HMOs - HMOPOP (b)	-0.097	0.263	0.908	-5.222 ***	1.398
1990 Percent of pop. age 65+ - ARF65 (b)	5.652	2.623	284.736 *	127.578 ***	12.021
1992 Per capita income ($10,000) - ARFPCI92	-0.130	0.153	0.878	-2.604 **	0.850
Physician supply per 10,000 pop. - DOCPOP	-0.008	0.338	0.992	0.667	1.430
Independent Variables - Practice Characteristics					
Practice size (solo is reference):					
2-5 - N2TO5	0.391	0.227	1.479	1.101	1.002
6-10 - N6TO10	-0.154	0.346	0.858	-1.217	1.707
11+ - N11PLUS	0.360	0.518	1.434	3.937	2.194
Institutional employee - NINST	-0.458	0.205	0.633 *	0.343	1.191
Multi-specialty group - MULTI	-0.291	0.378	0.747	-4.008 *	1.693
Independent Variables - Physician Characteristics					
Sex (1=female) - ZSEX	-0.468	0.193	0.626 *	-3.250 **	1.248
Decade graduated medical school - MEYRCAT1	-0.093	0.075	0.911	2.505 ***	0.386
Specialty (general/family practice is reference):					
Surgery - SP11SUR	0.009	0.329	1.009	8.029 ***	1.259
Internal medicine - SP11IM	0.470	0.333	1.600	17.389 ***	1.234
Obstetrics/gynecology - SP11OBG	-0.897	0.344	0.408 **	-17.802 ***	1.661
Pediatrics - SP11PED	-4.819	0.302	0.008 ***	-13.646 ***	2.923
Psychiatry - SP11PSY	-1.127	0.307	0.324 ***	-3.678 *	1.768
Other - SP11OTH	-1.578	0.317	0.206 ***	6.055 ***	1.870
Board certification status (1=certified) - CERT	0.682	0.182	1.978 ***	-1.334	1.007
Percent of patients uninsured - PATUN (b)	-2.260	0.446	0.104 ***	-17.565 ***	3.954
Intercept	0.9537	2.283		-4.835	11.464
Hosmer-Lemeshow goodness-of-fit test (p-value)	0.473				
R-Square/Pseudo r-square	0.525			0.289	

* Statistically significant at the .05 level.

** Statistically significant at the .01 level.

*** Statistically significant at the .001 level.

(a) These variables are percentages scaled from 0-1. The odds ratio for a 10 percentage point change is:

	DMCARE
MCDPRI	1.006
MCRPRI	1.336
FEEINDX	0.997

(b) These variables are percentages scaled from 0-1. The odds ratio for a 5 percentage point change is:

PATUN	0.893
HMOPOP	0.995
ARF65	1.327

Serving Medicaid patients

A two-stage analysis of serving Medicaid patients was conducted. First, logistic regression was used to look at the characteristics associated with whether or not a physician served Medicaid patients. Then, among those who did, multiple linear regression was used to look at correlates of the percent of the physician's patient load covered by Medicaid. Results from the two regression analyses — logistic and OLS — are presented in Table 5.5. Results of the two analyses are discussed simultaneously below.

Relative prices

The model predicts that physicians in areas with higher Medicaid fees relative to other sectors of the market will be more likely to have Medicaid patients and to have a larger percentage of them in their practices. This relationship has been found in other studies (e.g., Sloan, et. al. 1987). However, in this analysis, the ratio of Medicaid to private sector fees (MCDPRI) has no statistically significant association with DMCAID, and a negative relationship with PMCAID. This contradictory finding may be explained by the limited nature of MCDPRI, and the proxy used to measure the demand for Medicaid services.

MCDPRI takes on one of nine values, the mean across states for each census division, weighted by the population size of each state. Thus, there is little variation in this measure, which is ecological in nature. Furthermore, the regions also differ in

eligibility levels; generally, the income cutoffs for Medicaid receipt are higher in the Northeast and lower in the South. The proxy for Medicaid demand, per capita income (ARFPCI), will not adequately control for the differences in eligibility requirements. A more accurate measure of Medicaid demand, such as the percent of the population that is receiving Medicaid benefits, would be a more valid measure of demand. Unfortunately, this type of indicator, while available in the ARF dataset, was not among the variables merged with the SMS dataset for this analysis.

Market characteristics

While per capita income (ARFPCI) may not be a perfect proxy for Medicaid demand, the expected negative association was found. Physicians in wealthier areas are less likely to provide Medicaid services (DMCAID); the conditional odds-ratio for $5,000 difference in per capita income is 0.69 (p<.001). Demand for other sectors of the health care market (HMOPOP, ARF65) bear no statistically significant relationship to the Medicaid outcomes.

As predicted by the model, competition among physicians, as measured by physician supply per 10,000 population (DOCPOP), is associated with a 4.4 percentage point increase in the percent of patients that have Medicaid coverage among those who provide Medicaid services (PMCAID, p<.0001). There is no statistically significant effect for DMCAID. Also as predicted, physicians in urban areas (URBAN) are less likely to provide Medicaid services (DMCAID, OR=.38, p<.01) and have about 4 percent fewer Medicaid patients than their rural counterparts (PMCAID, p<.01).

Practice characteristics

Contrary to the model predictions, practice characteristics are associated with the Medicaid outcomes. A positive trend emerges between practice size and the probability of providing Medicaid services (DMCAID). In comparison to physicians in solo practice, the conditional odds ratios are 1.43 for physicians in small groups (2-5, p<.01), 1.67 for those in medium-size groups (6-10, p<.05), and 2.9 for those in large groups (p<.01). Physicians practicing in multi-specialty groups (MULTI), however, are less likely to provide Medicaid services than those in other practice settings (OR=.53, p<.01). Little difference by practice size is seen in the percent of patients covered by Medicaid (PMCAID). These findings suggest that larger groups may be less restrictive in their acceptance of Medicaid beneficiaries, but do not treat a larger number of them.

Physicians who are employees of institutions (NINST) are almost 3 times more likely to provide Medicaid services (DMCAID, OR=2.8, p<.001) than those in solo practice. On average, their practices include 8.8 percent more Medicaid beneficiaries than those of solo practioners (PMCAID, p<.001). These findings may reflect the reliance of Medicaid beneficiaries on emergency rooms and hospital clinics for medical care noted in the literature (Watson 1995).

Physician characteristics

Specialty as a concept is a statistically significant predictor of DMCAID (LRT, p<.001). There is no difference between general/family practioners, pediatricians, and

obstetrician-gynecologists in the probability of providing Medicaid services. However, surgeons and internists are more likely to provide Medicaid services (OR=2.4 and 1.6, respectively; p<.001 and p<.05, respectively), and psychiatrists and other physicians are less likely to do so (OR=.55 and .59, respectively; p<.01 and p<.05, respectively). Among those serving Medicaid beneficiaries, however, pediatricians have the highest patient load (PMCAID, 17 percent more than general/family practitioners, p<.001), followed by psychiatrists (10.6, p<.001) and obstetrician-gynecologists (6.0, p<.001). This suggests that the specialties most in demand for Medicaid beneficiaries, pediatricians, obstetrician-gynecologists, and general/family practioners, are more likely than their medical/surgical colleagues to decide not to accept Medicaid. Among those who do, however, use of their services is high. This confirms concerns regarding access to primary care physicians, pediatricians, and obstetrician/gynecologists for Medicaid beneficiaries.

More experienced physicians were found to be less likely to have Medicaid patients (DMCAID, OR=.79 per decade, p<.001), but no differences were found in Medicaid patient loads by experience (PMCAID). Contrary to other studies (Perloff, et. al. 1995; Fairbrother, et. al. 1995), uncertified physicians were not more likely than board certified physicians to provide Medicaid services (DMCAID). However, among those with Medicaid patients, uncertified physicians do, on average, have a larger share of Medicaid patients in their practices (PMCAID, -6.7, p<.001). Similarly, female physicians are no more or less likely than their male counterparts to have Medicaid

patients (DMCAID), but female physicians with Medicaid patients have a larger percentage of them than their male counterparts (PMCAID, 7.03, $p<.001$).

A strong relationship was found between the proxy for altruism, the percent of patients that are uninsured (PATUN), and the Medicaid outcomes. In model specifications with a linear function of PATUN, the variable was not statistically significant. When a quadratic function was modeled, the relationship became statistically significant. Examination of the residuals also supported a quadratic relationship. A positive, increasing association exists at lower levels of PATUN that decreases in strength and becomes negative at higher levels of PATUN, as shown in figures 5.3 and 5.4.

Figure 5.3 graphs the conditional log-odds and odds ratios associated with a 5 percent increase in the percent of patients that are uninsured[3]. The odds ratio for an increase from 0 to 5 percent is 1.25; for an increase from 5 to 10 percent it is 1.20. The conditional odds ratio continues to be greater than one, but decreasing in size until PATUN reaches 30 percent. Thus, from 0 to 30, an increase in PATUN is associated with increased conditional odds of providing Medicaid services (DMCAID);

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[3] PATUN is scaled from 0-1. The equation used to calculate the effect of a 5 percentage point change in PATUN at any given value of PATUN is: $\exp(.05*4.78 + 2*.05*-7.74*\text{PATUN} + .05*.05*-7.74)$.

after that point, the conditional odds decrease. In relationship to PMCAID, PATUN has a maximum conditional effect of 8.4 percentage points when it equals approximately .50. This inverted u-shape is consistent with the hypothesis that more altruistic physicians will be more likely to have larger percentages of Medicaid beneficiaries in their practices, up to a point. The findings suggest that there is a threshold, around 50 percent, beyond which the strength of the relationship diminishes. The relationship between the percent of patients who are uninsured and those who are Medicaid beneficiaries must also obey the logical constraint that as one approaches 100 percent, the other must approach zero.

Summary

The relative price variables (MCDPRI, MCRPRI) do not show the expected relationship to the Medicaid outcomes, perhaps due to issues of measurement validity. The measure of demand for the Medicaid sector (ARFPCI), however, has the expected relationship to participation in Medicaid: physicians in areas with lower per capita income are more likely to participate in Medicaid. Also as predicted, physicians in areas with greater competition (DOCPOP) are more likely to participate, while those in urban areas are less likely to participate in Medicaid. Contrary to the model prediction of no effect of practice size, these findings suggest that larger groups may be less restrictive in their acceptance of Medicaid beneficiaries, but do not treat a larger proportion of them. As expected, physicians working for institutions are more likely to participate in the Medicaid programs. The findings regarding specialty are not quite as predicted, with

internists and surgeons more likely to serve Medicaid beneficiaries. They suggest that those specialties most in need for Medicaid (pediatricians, obstetrician-gynecologists, and general/family practioners) are more likely to refuse Medicaid patients, but among those who do participate, these specialties have, on average, a higher Medicaid patient load. This is consistent with other findings and concerns over an access problem for Medicaid beneficiaries. In addition, less experienced and uncertified physicians have more Medicaid patients, signaling questions about the equality of care across sectors. The findings regarding physician altruism (PATUN) suggest that more altruistic physicians are more likely to have Medicaid beneficiaries, up to a point.

Table 5.5 Regression Results for Medicaid Participation

Variable (Name)	Provides Medicaid Services (DMCAID) coeff.	s.e.	O.R.	Percent Patients Medicaid Beneficiaries (PMCAID) coeff.	s.e.
Comparative Fee Information					
Medicaid vs. private fees - MCDPRI (a)	-0.218	0.454	0.804	-7.518 ***	2.758
Medicare vs. private fees - MCRPRI (a)	0.3	1.867	1.35	8.361	10.59
Physician's usual fee - FEEINDX (a)	-0.346	0.092	0.708 ***	-0.947	0.732
Market Characteristics (MSA Level)					
Urban residence (50,000+) - URBAN	-0.962	0.323	0.382 **	-3.798 **	1.215
Percent of pop. in HMOs - HMOPOP (b)	0.033	0.191	1.034	-0.872	1.208
1990 Percent of pop. age 65+ - ARF65 (b)	2.911	1.852	8.367	-13.39	10.2
1992 Per capita income ($10,000) - ARFPCI92	-0.737	0.109	0.479 ***	-2.561 ***	0.774
Physician supply per 10,000 pop. - DOCPOP	0.462	0.331	1.586	4.407 ***	1.177
Practice Characteristics					
Practice size (solo is reference):					
2-5 - N2TO5	0.359	0.144	1.432 **	-1.856 *	0.867
6-10 - N6TO10	0.51	0.246	1.665 *	-0.785	1.436
11+ - N11PLUS	1.058	0.333	2.881 **	-0.988	1.867
Institutional employee - NINST	1.031	0.183	2.805 ***	8.803 ***	0.991
Multi-specialty group - MULTI	-0.641	0.236	0.527 **	-0.163	1.451
Physician Characteristics					
Sex (1=female) - ZSEX	0.136	0.169	1.146	7.031 ***	1.002
Decade graduated medical school - MEYRCAT1	-0.236	0.052	0.79 ***	0.566	0.334
Specialty (general/family practice is reference):					
Surgery - SP11SUR	0.872	0.205	2.392 ***	-1.014	1.099
Internal medicine - SP11IM	0.485	0.19	1.625 *	-1.764	1.09
Obstetrics/gynecology - SP11OBG	-0.339	0.224	0.712	6.017 ***	1.493
Pediatrics - SP11PED	0.372	0.254	1.451	17.36 ***	1.405
Psychiatry - SP11PSY	-0.606	0.219	0.546 **	10.56 ***	1.609
Other - SP11OTH	-0.527	0.232	0.591 *	-0.174	1.665
Board certification status (1=certified) - CERT	0.159	0.136	1.172	-6.733 ***	0.864
Percent of patients uninsured - PATUN (b)	4.777	1.094	8.797 ***	33.83 ***	7.022
Percent uninsured squared- PATUNSQ (b)	-7.736	1.303	0 ***	-34.22 ***	10.58
Intercept	3.677	1.722		22.006	9.738
Hosmer-Lemeshow goodness-of-fit test (p-value)	0.339				
R-Square/Pseudo r-square	0.204			0.268	

* Statistically significant at the .05 level.

** Statistically significant at the .01 level.

*** Statistically significant at the .001 level.

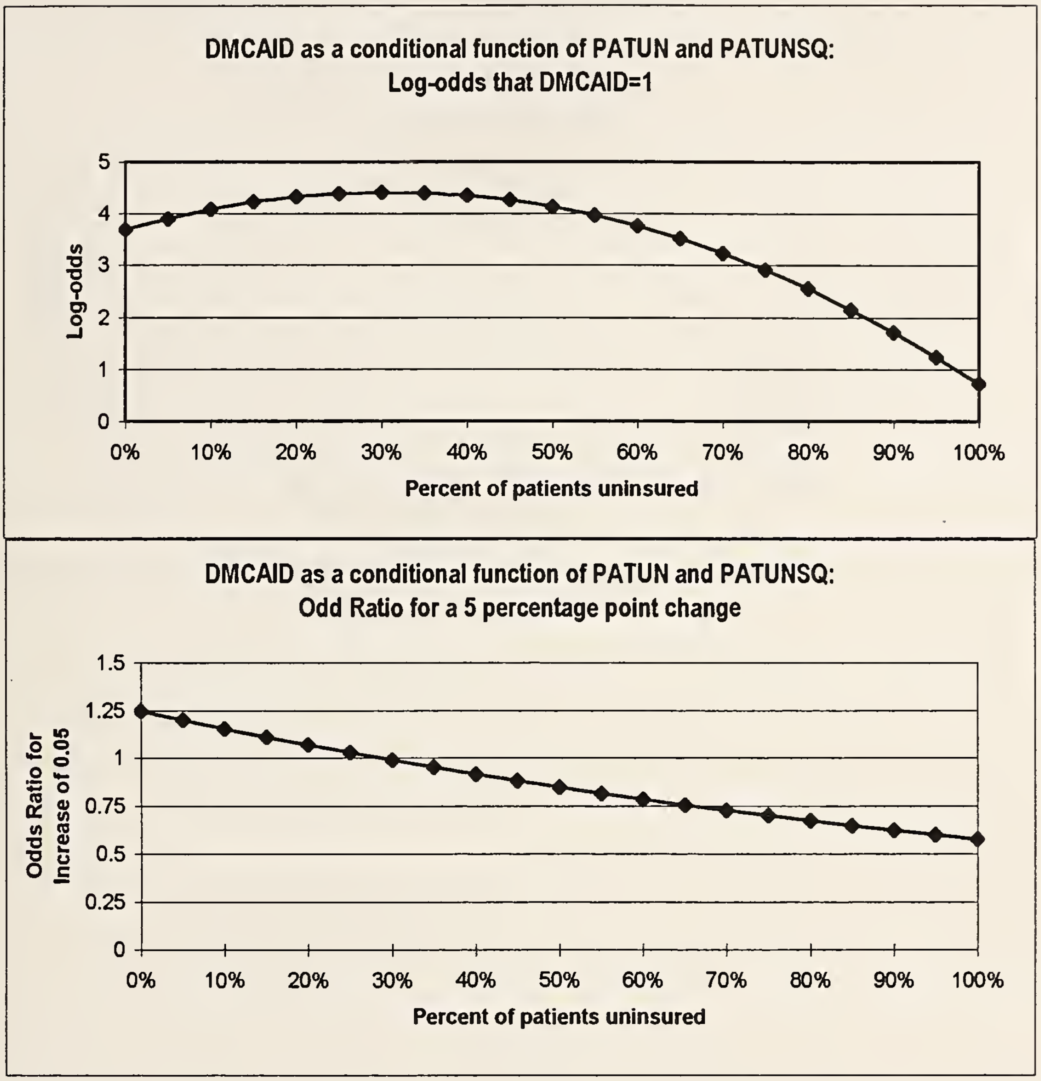
(a) These variables are percentages scaled from 0-1. The odds ratio for a 10 percentage point change is:

	DMCAID
MCDPRI	0.978
MCRPRI	1.030
FEEINDX	0.966

(b) These variables are percentages scaled from 0-1. The odds ratio for a 5 percentage point change is:

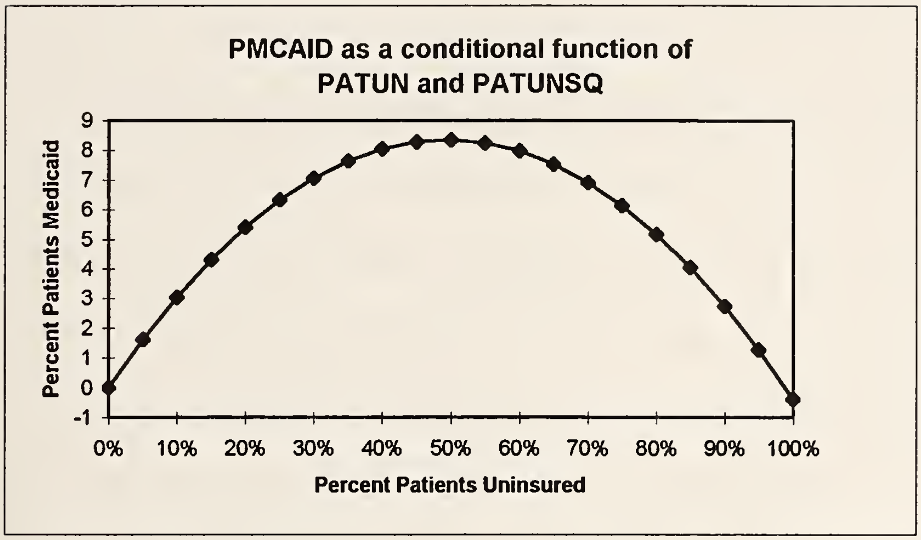
PATUN	1.270 (change from 0-.05)
PATUNSQ	0.003 (change from 0-.05)
HMOPOP	1.002
ARF65	1.157

Figure 5.3. Conditional Relationship Between Provision of Medicaid Services (DMCAID) and Percent of Patients Uninsured (PATUN)


DMCAID as a conditional function of PATUN and PATUNSQ:
Log-odds that DMCAID=1

DMCAID as a conditional function of PATUN and PATUNSQ:
Odd Ratio for a 5 percentage point change

Figure 5.4 Conditional Relationship Between the Percent of Patients that are Medicaid Beneficiaries (PMCAID) and Percent of Patients Uninsured (PATUN)



Chapter 6: Polytomous Logistic Regression Analyses and Results

A central concern of this analysis is the association of managed care participation with provision of services to individuals covered by the public sector programs of Medicare and Medicaid —that is, the analysis of the relationships between dependent variables. While these associations are not to be interpreted as causal, they provide information on the extent to which physicians involved in the public sector programs are also involved in managed care arrangements. The overlap or lack of overlap in managed care contracting and public sector program participation may inform efforts to increase the use of managed care arrangements in the Medicare and Medicaid programs. For example, HCFA may wish to monitor the specialty mix of physicians in Medicare managed care given that internists and surgeons have high rates of participation with Medicare and low rates of participation in managed care. Similarly, Medicaid programs may want to take special steps to ensure that institutional physicians, which have large Medicaid patient loads and lower rates of managed care participation, are part of Medicaid managed care plans. Table 6.1 provides bivariate statistics summarizing these associations. The results of multivariate analyses of these relationships using polytomous logistic (multinomial logit) regression (PLR/MLR) are presented later in this chapter. A final section suggests and analyzes a categorization of physicians based on their patterns of participation with each of the sectors investigated.

Intersection of participation with managed care and public sector programs

Physicians with managed care contracts were twice as likely to provide Medicare services than those without managed care contracts (OR= 2.34, p=.001). Among those who provide Medicare services, however, physicians with managed care contracts had a somewhat smaller Medicare patient load. On average, 33.5 percent of their patients were covered by Medicare, compared to 38.1 percent for physicians without managed care contracts. Thus, managed care contracting was positively associated with provision of Medicare services, but slightly negatively associated with the percent of patients covered by Medicare. A negative correlation was also found between the percent of revenues derived from managed care and the percent of patients covered by Medicare (pearson correlation coefficient: -0.22).

Physicians with managed care contracts were almost 80 percent more likely to provide Medicaid services than those without managed care contracts (OR=1.78, p=.001). As with Medicare, however, managed care was associated with a lower patient-load covered by the public-sector program. Among physicians who provide Medicaid services, those who also have managed care contracts averaged 14.6 percent of patients insured by Medicaid, while the Medicaid patient load for those without managed care contracts was 24.5 percent. In addition, the correlation between a physician's Medicaid patient load and the percent of his/her revenues derived from managed care was -0.17.

Table 6.1 Intersection of Participation in Managed Care and Public Sector Programs			
	Has managed care contract	**Does not have managed care contract**	**p-value**
Provides Medicare Services **Does Not Provide Medicare Services**	2045 (70.2%) 234 (8.0%)	501 (17.2%) 134 (4.6%)	.001 (a)
Provides Medicaid Services **Does Not Provide Medicaid Services**	1964 (67.4%) 315 (10.8%)	494 (17.0%) 141 (4.8%)	.001 (a)
Avg. Percent Of Patients Covered By Medicare (Where DMCARE=1)	33.51%	38.11%	.0003 (b)
Avg. Percent Of Patients Covered By Medicaid (Where DMCAID=1)	14.56%	24.46%	.0001 (b)
(a) Chi-Square Test Of Association (b) Two Sample T-Test For Difference Of Means			

Managed care contracting and serving Medicare patients

Polytomous logistic (multinomial logit) regression models the log-odds of alternative, discrete multinomial outcomes. For a categorical outcome with m levels, m-1 equations are solved simultaneously. Each equation models the log-odds of a given category versus a common reference category. It is used here to model the likelihood of being in each of the four cells of the cross-table of physicians for having a managed care contract and providing Medicare services (Table 6.2).

Table 6.2 Cross-Tabulation of MCCONT and DMCARE		
	Provides Medicare Services -Yes	**Provides Medicare Services - No**
Has Managed Care Contract - Yes	2045 (70.2%) Ref. Cat.	234 (8.0%) Cell 2
Has Managed Care Contract - No	501 (17.2%) Cell 3	134 (4.6%) Cell 4

The **reference category** for this analysis is those physicians who both have managed care contracts and provide Medicare services. It was chosen to be the reference category for a number of reasons. First, the majority of physicians are in this group. Second, many of the policy questions concerning the relationship between Medicare and managed care involve departures from this group. Which physicians are involved in neither managed care nor Medicare? Which provide Medicare services, but do not have managed care contracts? Which participate in managed care arrangements but not Medicare?

Equation 1 models the probability of being in cell 2 versus the reference category—that is, the probability of having managed care contracts but not accepting Medicare patients vs. having a managed care contract and accepting Medicare patients. **Equation 2** models the probability of being in cell 3 versus the reference category—that is, the probability of not having managed care contracts but accepting Medicare patients vs. having a managed care contract and accepting Medicare patients. **Equation 3** models the probability of being in cell 4 versus the reference category—that is, the probability of not having managed care contracts nor accepting Medicare patients vs. having a managed care contract and accepting Medicare patients.

In order to avoid estimation problems arising from zero or sparse cell counts, two sets of dummy variables were collapsed into a smaller number of categories. Practice size was collapsed from five to four groups, with physicians in practices with 6 to 10 physicians combined with those with 11 or more. The revised distribution is: 39 percent

in solo practice, 25 percent in practices with 2 to 5 physicians, 14 percent in practices of 6 or more physicians, and 19 percent working as institutional employees. Specialty categories were collapsed from seven into four groups: general/family practice (reference group, 16 percent), medical specialties (33 percent), surgical specialties (36 percent), and "other" specialties (15 percent).

The following section highlights significant results from the polytomous logistic regression analysis, organized by the conceptual model. Table 6.3 shows the direction of the effect for each variable across the three equations: (+) for positive coefficients, (–) for negative coefficients, and (n.s.) for coefficients that are not statistically different from zero. A full set of results can be found in Appendix 7. Table 6.4 summarizes the characteristics of physicians found in each cell of the cross-tabulation of having managed care contracts and providing Medicare services.

Relative prices

None of the relative price variables have a statistically significant relationship to the outcomes.

Market characteristics

The relevant market demand variables — the percent of population enrolled in HMOs, and the percent of the population over age 65 — have a limited effect, but one that is consistent with the model. In areas with a greater proportion of elderly, physicians

are less likely to fall into cell 4, neither having a managed care contract nor providing Medicare services, than the reference group. In areas where a larger fraction of the population is in HMOs, physicians are less likely to fall in cell 3, not having a managed care contract but providing Medicare services, than the reference group or other cells. Thus, the positive relationships between demand for physician services and physician participation with managed care and Medicare are maintained. The level of competition among physicians has a positive association with cell 3, not having a managed care contract but providing Medicare services. This coincides with the findings from the two-stage analyses that physician supply has a negative relationship to managed care participation and a positive one with Medicare participation. Physicians in urban areas are no more or less likely than those in rural areas to fall into cells 2 or 4 (not providing Medicare services) than the reference category. They are less likely to fall into cell 3 (providing Medicare services, but not having a managed care contract). Rural physicians are more than twice as likely as urban physicians to be in cell 3 (1/.47 = 2.14), reflecting a lower probability of having managed care contracts in rural areas even after accounting for the demand for managed care. This finding raises a question about access to Medicare managed care in rural areas.

Practice characteristics

While the practice size variables are not consistently statistically significant, they indicate that physicians in larger practices (more than 6 physicians) are more likely than solo practitioners to fall into cell 2 and the reference group – both of which are characterized by having a managed care contract. By contrast, institutional employees

are more than twice as likely as those working in a practice setting to have neither managed care contracts nor Medicare patients (cell 4, OR=2.25, p=.001). Those in multi-specialty group practices are less likely to fall into cell 2, having managed care contract(s) but not providing Medicare services.

Physician characteristics

The PLR/MLR results are consistent with the previous findings about the relationship of years of experience with managed care contracting and provision of Medicare services. More experienced physicians are more likely to fall into categories other than the reference group. Statistical testing (Wald tests for equality of coefficients across equations) indicates that while these odds ratios for cells 2 (1.18, p=.03), 3 (1.31, p=.05), and 4 (1.35, p=.001) are all different from the reference group, they are not different from one another. This finding has implications for the Medicare program as it considers moving more beneficiaries into managed care programs. Beneficiaries may find that their usual doctors, who tend to be older, do not participate in managed care programs. This may pose a barrier to access to traditional providers of care, thereby disrupting continuity ("longitudinality") of care.

Findings regarding specialty suggest physicians in medical and surgical specialties have increased odds of being in cell 2 — having managed care contracts, but not providing Medicare services versus doing both. For medical specialties, the relative odds are greatest for cell 2, followed by cell3, cell4, and finally, the reference category; statistical tests indicate that the odds of each cell are different from the others. These

relative odds are both statistically significant and important. The odds ratios are 32.8, 1.3, and 3.0 for cells 2, 3, and 4, respectively. Physicians in "other" specialties have increased odds of falling into cells other than the reference cell. These findings suggest that while these specialties are, in absolute probability, most likely to be in the reference category, in relative terms, they are less likely than general/family practitioners to have both managed care contracts and serve Medicare patients. Thus, attention should be paid to preserving access to specialists in a Medicare managed care environment.

In the polytomous model, female physicians have increased odds of falling into cells 2 (OR=3.3, p<.001) and 4 (OR=2.4, p<.001), . Thus, they are less likely to have Medicare patients than male physicians. Board-certified physicians (CERT) are more likely to have both managed care contracts and Medicare patients (reference category) than to be in cells without managed care contracts (or for cell 3=.465, p<.001; or for cell 4=.317, p<.001).

The percent of uninsured patients is a significant predictor in all three equations. Having a greater proportion of uninsured patients increases the odds that a physician will fall into cell 4 (OR for 5 percentage point difference = 1.23, p<.001), followed by cell 3 (OR for 5 percentage point difference = 1.15, p<.001), both of which have no managed care contracts. Having more uninsured patients also increases the odds of being in cell 2 versus the reference (or 1.10, p=.006). Statistical testing indicates that there is no difference between the OR for cell2 and cell3, but that both 2 and 3 are different from 4. Altruism, as measured by the percent of uninsured patients in the practice, appears to be

an important correlate of physician's decision making regarding participation in the various sectors of the health care market. The negative association between altruism and managed care raises concerns about access to services among more vulnerable citizens as the prevalence of managed care increases.

Summary

As shown in table 6.4, there are differences among the types of physicians that fall into the four cells of the cross-tab for managed care contracting and provision of Medicare services. Those who participate in both sectors (cell 1) tend to practice in areas with a greater level of HMO market penetration. They are more likely than the physicians in other cells to be, on average, less experienced, board certified male physicians who are general/family practioners. They tend to have fewer uninsured patients. Those at the other extreme, having neither managed care contracts, nor Medicare patients (cell 4), are more likely than other physicians, on average, to practice in areas with fewer elderly citizens. They are more likely than those in cell 1 to be more experienced, uncertified, female, and employees of medical institutions. More medical or other specialties are represented in this group, which, on average, has more uninsured patients.

Those who have managed care contracts but do not provide Medicare services (cell 2) tend to be more experienced, female physicians that are not general/family practioners. They are more likely than those with both managed care contracts and Medicare patients to be in large practices and to have more uninsured patients. Those

who do not have managed care contracts but do provide Medicare services (cell 3) are more likely than those in the reference group to practice in rural areas, in areas with lower demand in the managed care sector, and in areas with higher physician supply. They tend to by more experienced, uncertified physicians working in solo practices. They are likely to have more uninsured patients and be in "other" specialties than the physicians in the reference group.

Table 6.3 Intersection of Managed Care Contracting and Provision of Medicare Services (MCCONT*DMCARE): Direction of Effects

Reference Category is Cell 1: MCC Y DMC Y

	Cell2 MCC Y DMC N	Cell 3 MCC N DMC Y	Cell 4 MCC N DMC N
Relative Prices			
Medicaid vs. private fees - MCDPRI	n.s.	n.s.	n.s.
Medicare vs. private fees - MCRPRI	n.s.	n.s.	n.s.
Physician's usual fee - FEEINDX	n.s.	n.s.	n.s.
Market Characteristics (MSA Level)			
Urban residence (50,000+) - URBAN	n.s.	-	n.s.
Percent of pop. in HMOs - HMOPOP (a)	n.s.	-	n.s.
1990 Percent of pop. age 65+ - ARF65 (a)	n.s.	n.s.	-
1992 Per capita income ($10,000) - ARFPCI92	n.s.	n.s.	n.s.
Physician supply per 10,000 pop. - DOCPOP	n.s.	+	n.s.
Practice Characteristics			
Practice size:			
2-5 - N2TO5	n.s.	-	n.s.
6+ 6PLUS	+	-	n.s.
Institutional employee - NINST	n.s.	n.s.	+
Multi-specialty group - MULTI	-	n.s.	n.s.
Physician Characteristics			
Sex (1=female) - ZSEX	+	n.s.	+
Decade graduated medical school - MEYRCAT1	+	+	+
Specialty:			
Medical specialties - SP4MED	+	n.s.	+
Surgical specialties - SP4SUR	+	n.s.	n.s.
Other specialties- SP4OTH	+	+	+
Board certification status (1=certified) - CERT	n.s.	-	-
Percent of patients uninsured - PATUN (a)	+	+	+

Table 6.4 Intersection of Managed Care Contracting and Provision of Medicare Services (MCCONT*DMCARE): Results

	Provides Medicare services (DMC Y)	Does not provide Medicare services (DMC N)
MCC Y	**Reference Category (n=2038, 69.9%)** ***Relative Prices*** n.s. ***Market Characteristics*** Higher HMO market penetration ***Practice Characteristics*** n.s. ***Physician Characteristics*** Less experienced physicians General/family practice Male physicians Certified Fewer uninsured patients	**Cell 2 (n=261, 9.0%)** ***Relative Prices*** n.s. ***Market Characteristics*** n.s. ***Practice Characteristics*** Larger practice size (6+, 1.8, p=.04) ***Physician Characteristics*** Female physicians (3.3, p<.001) More experienced physicians (1.18, p=.03) Medical specialty (32.8, p<.001) Other specialty (12.9, p<.001) Surgical specialty (5.5, p=.007) More uninsured patients (1.10,p=.006)*
MCC N	**Cell 3 (n=487, 16.7%)** ***Relative Prices*** n.s. ***Market Characteristics*** Lower HMO market penetration (.97, p=.002)* Rural areas (2.14, p<.001) Higher physician supply (1.4, p=.05) ***Practice Characteristics*** Solo practice ***Physician Characteristics*** More experienced physicians (1.3, p<.001) Uncertified physicians (1/.47=2.13, p<.001) “Other” specialties (2.2, p<.001) More uninsured patients (1.15, p<.001)*	**Cell 4 (n=128, 4.4%)** ***Relative Prices*** n.s. ***Market Characteristics*** Smaller percentage of elderly (.62, p=.000)* ***Practice Characteristics*** Works in institutional setting (2.26, p<.001) ***Physician Characteristics*** More experienced physicians (2.43, p<.001) Medical specialties (2.96, p=.001) Other specialties (2.80, p<.001) Uncertified physicians (1/.32=3.15, p<.001) Female physicians (2.44, p<.001) More uninsured patients (1.23, p=.000)*

* OR for 5 percentage point difference.

Managed care contracting and serving Medicaid patients

This section presents results of PLR/MLR analysis for the four cells of the cross table for physicians of having a managed care contract and serving Medicaid patients (Table 6.5). The reference category for the analysis is cell 1 — having managed care contract(s) and serving Medicaid patients. **Equation 1** models the probability of being in cell 2 versus the reference category. That is, the probability of having managed care contracts but not serving Medicaid patients vs. having a managed care contract and serving Medicaid patients. **Equation 2** models the probability of being in cell 3 versus the reference category. That is, the probability of not having managed care contracts but serving Medicaid patients vs. having managed care contracts and serving Medicaid patients. **Equation 3** models the probability of being in cell 4 versus the reference category. That is, the probability of neither having managed care contracts nor serving Medicaid patients vs. having a managed care contract and serving Medicaid patients.

The following section highlights significant results from the polytomous logistic regression analysis, organized by the conceptual model. Table 6.6 shows the direction of effect for the coefficients of the independent variables for each equation. A full set of results can be found in Appendix 7. Table 6.7 summarizes the characteristics of physicians found in each cell of the cross-tabulation of having managed care contracts and providing Medicaid services.

Table 6.5 Cross-Tabulation of MCCONT and DMCAID		
	Provides Medicaid Services - Yes	**Provides Medicaid Services - No**
Has Managed Care Contract - Yes	1964 (67.4%) Cell 1- Ref.	315 (10.8%) Cell 2
Has Managed Care Contract - No	494 (17.0%) Cell 3	141 (4.8%) Cell 4

Relative prices

The relative likelihood of having managed care contracts while not providing Medicaid services (cell 2), versus doing both (cell 1 - ref.), is increased among physicians with higher usual fees.

Market characteristics

Physicians in areas with higher HMO penetration rates have a decreased relative likelihood of providing Medicaid services but not have managed care contracts (cell 3) than to be in the reference group, thereby maintaining the positive relationship between demand in the managed care sector and contracting with managed care. As might be expected, given that Medicaid eligibility is dependent on income, physicians in areas with higher per capita income have increased odds of falling in cells 2 and 4, without Medicaid patients. The relative likelihood of providing Medicaid services, but not having managed care contracts (cell 3) was increased in areas with greater physicians supply. Thus, competition among physicians seems to have the expected, positive relationship to Medicaid participation, but the opposite relationship to having a managed care contract.

Physicians in urban areas have increased odds of having managed care contracts, but not providing Medicaid services (cell 2), while rural physicians have greater odds of providing Medicaid services but having no managed care contracts (cell 3). This suggests a potential access problem in rural areas as Medicaid moves into managed care.

Practice characteristics

Physicians in larger practices are most likely to be in the reference category, having managed care contract(s) and providing Medicaid services. This implies that solo physicians are relatively less likely than those in larger practices to both have managed care contracts and provide Medicaid services. Institutional physicians are relatively less likely than those in solo practice to fall into cells 2 (OR=0.28) and 4 (OR=.61) than in the reference group, and relatively more likely to be in cell 3 (OR=1.4), not having managed care contracts but providing Medicaid services. Statistical testing indicates that these odds ratios are all significantly different from one another. This indicates that physicians working for institutions are relatively more likely to have Medicaid patients, either with or without managed care contracts.

Physician characteristics

Physicians with more experience have increased relative odds of being in all cells other than the reference group. They relative odds are greatest for cell4, having no managed care contracts and providing no Medicaid services (1.6, p<.0001), followed by having no managed care contracts but providing Medicaid services (1.29, p<.0001), and

having a managed care contract but not providing Medicaid services (1.25, p<.0001). Statistical testing indicates that these odds ratios are all different from one another at conventional levels of significance.

Compared with general/family practitioners, surgeons are less likely to be in cell 2 — having managed care contracts, but not providing Medicaid services — than to be in the reference category. Physicians in "other" specialties have increased relative odds of falling in groups 3 and 4, providing Medicaid services either with or without managed care contracts. Board certified physicians are more likely to be in categories 1 and 2, with managed care contracts. In contrast, uncertified physicians have greater odds than certified physicians of being in categories 3 (OR=1/0.43=2.33) and 4 (OR=1/0.37=2.72), rather than in the reference category. Assuming that board certification is an adequate proxy for quality, this raises a concern about the quality of care received by Medicaid beneficiaries. It also suggests that to maintain continuity (longitudinality) of care as Medicaid moves into managed care, either traditional providers will have to obtain board certification or the general practice of requiring board certification to contract with managed care organizations will have to change.

The relationship between the percent of uninsured patients and the log-odds of the outcome variables is modeled as a quadratic function. This relationship indicates that the level of altruism is associated with the probability of falling in each cell, but that a threshold effect exists. Figure 6.1 plots the conditional odds-ratio for each cell of a 5 percentage point change in PATUN against PATUN. In comparison to the reference

group (having managed care contract(s) and serving Medicaid patients), physicians with greater proportions of uninsured patients have: (a) a lower, but increasing probability of having managed care contracts but not providing Medicaid services (cell2); (b) a higher, but decreasing probability of providing Medicaid services but not having managed care contracts (cell3); and (c) a higher, and sharply increasing probability of neither having managed care contracts nor providing Medicaid services (cell4). At lower levels of percent patients uninsured (0-25 percent), physicians have increased relative odds of participating in Medicaid but not managed care. At higher levels of percent patients uninsured (greater than 50 percent), physicians have increased relative odds of participating in neither managed care nor Medicaid.

Summary

The characteristics of physicians falling in each cell of the cross-tab are summarized in Table 6.7. Physicians who have both managed care contracts and Medicaid patients (cell 1) tend to be less experienced physicians working in larger practices. Those at the other extreme, having neither managed care contracts nor Medicaid patients (cell 4) tend to practice in areas with higher per capita incomes. They are, in comparison to the reference group, , more likely to be more experienced, uncertified physicians in "other" specialties who are in solo practice. These physicians also tend to have more uninsured patients than those in cell 1.

Physicians with managed care contracts who do not have Medicaid patients (cell 2) are more likely, on average, to be in areas with lower demand for physician services in

the Medicaid market (higher per capita income). They are more likely than those in the reference cell to be general/family practioners (including pediatricians) and to be in solo practice. On average, they charge higher fees and treat fewer uninsured patients than those who have both managed care contracts and Medicaid patients. Physicians who treat Medicaid patients but do not have managed care contracts (cell 3), by contrast, are more likely than those in the reference group to practice in rural areas, areas with lower demand in the managed care sector, and higher physician supply. They are, on average, more likely to be experienced and uncertified physicians, either working in solo practice or as institutional employees. They see more uninsured patients than the physicians in cell 1.

Table 6.6 Intersection of Managed Care Contracting and Provision of Medicaid Services (MCCONT*DMCAID): Direction of Effects

Reference Category is Group 1: MCC Y DMD Y

	Cell2 MCC Y DMD N	Cell 3 MCC N DMD Y	Cell 4 MCC N DMD N
Relative Prices			
Medicaid vs. private fees - MCDPRI	n.s.	n.s.	n.s.
Medicare vs. private fees - MCRPRI	n.s.	n.s.	n.s.
Physician's usual fee - FEEINDX	+	n.s.	n.s.
Market Characteristics (MSA Level)			
Urban residence (50,000+) - URBAN	+	-	n.s.
Percent of pop. in HMOs - HMOPOP (a)	n.s.	-	n.s.
1990 Percent of pop. age 65+ - ARF65 (a)	n.s.	n.s.	n.s.
1992 Per capita income ($10,000) - ARFPCI92	+	n.s.	+
Physician supply per 10,000 pop. - DOCPOP	n.s.	+	n.s.
Practice Characteristics			
Practice size:			
2-5 - N2TO5	n.s.	-	-
6+ 6PLUS	-	-	-
Institutional employee - NINST	-	+	n.s.
Multi-specialty group - MULTI	+	n.s.	n.s.
Physician Characteristics			
Sex (1=female) - ZSEX	n.s.	n.s.	n.s.
Decade graduated medical school - MEYRCAT1	+	+	+
Specialty:			
Medical specialties - SP4MED	n.s.	n.s.	n.s.
Surgical specialties - SP4SUR	-	n.s.	n.s.
Other specialties- SP4OTH	n.s.	+	+
Board certification status (1=certified) - CERT	n.s.	-	-
Percent of patients uninsured - PATUN	-	+	n.s.
Percent of patients unins. squared - PATUNSQ	+	n.s.	+

Figure 6.1 Conditional Relationship Between the Intersection of Managed Care Contracting and Provision of Medicaid Services (MCCONT*DMCAID) and Percent of Patients Uninsured (PATUN)

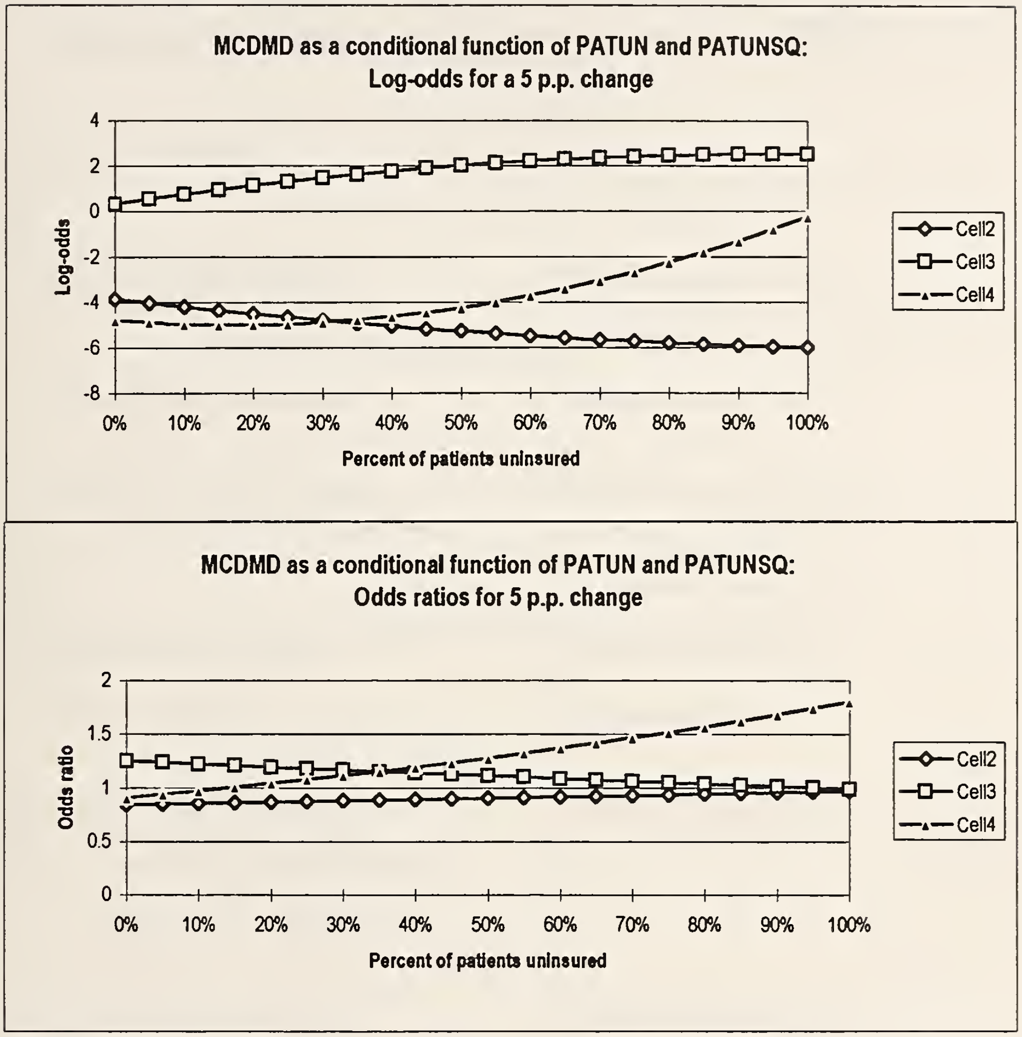


Table 6.7 Intersection of Managed Care Contracting and Provision of Medicaid Services (MCCONT*DMCAID): Results

	Provides Medicaid Services (DMD Y)	Does not provide Medicaid Services (DMD N)
MCC Y	**Reference Category (n=2038, 69.9%)** ***Relative Prices*** n.s. ***Market Characteristics*** Lower pci ***Practice Characteristics*** Larger practice size ***Physician Characteristics*** Less experienced physicians	**Cell 2 (n=261, 9.0%)** ***Relative Prices*** Relatively higher usual fees (1.04, p<.001)* ***Market Characteristics*** Urban areas (2.9, p=.02) Higher per capita income (2.25, p<.001) ***Practice Characteristics*** Solo practice ***Physician Characteristics*** More experienced physicians (1.25, p<.001) General/family practice
MCC N	**Cell 3 (n=487, 16.7%)** ***Relative Prices*** n.s. ***Market Characteristics*** Rural areas (2.0, p<.001) Lower HMO market penetration (.965, p<.001)** Higher physician supply (1.41, p=.04) ***Practice Characteristics*** Solo practice Institutional employee (1.42, p=.02) ***Physician Characteristics*** More experienced physicians (1.29, p<.001) "Other " specialties (1.68, p=.009) Uncertified physicians (2.33, p<001) More uninsured, decreasing over x***	**Cell 4 (n=128, 4.4%)** ***Relative Prices*** n.s. ***Market Characteristics*** Higher per capita income (1.95, p<.001) ***Practice Characteristics*** Solo practice ***Physician Characteristics*** More experienced physicians (1.55, p<.001) Other specialties (4.18, p<.001) Uncertified physicians (2.72, p<.001) More uninsured, increasing over x***

* OR for 10 percentage point change.

** OR for 5 percentage point change.

*** See Figure 6.1.

A typology of physician participation

The previous sections looked at the bivariate relationships between managed care contracting and each of the public sector programs. This section looks at all possible combinations of participation, and develops a typology of physicians based on their participation (or lack thereof) with managed care, Medicare, and Medicaid. Table 6.8 presents the eight possible combinations of participation in these three sectors. The largest group is those who participate in all three sectors – 1,772 physicians, or 60.8 percent of the sample. The next largest group is those who do not have managed care contracts, but have both Medicare and Medicaid patients – 424, or 14.6 percent of the sample. Only 65 physicians, or 2.2 percent of the sample, participate in none of the three sectors.

Table 6.8 Participation Patterns

Combination (Y=Yes, the physician participates in that sector; N=No, s/he does not)	**No. of Physicians**	**Percent**
Managed Care Y, Medicare Y, Medicaid Y	1772	60.8%
Managed Care Y, Medicare Y, Medicaid N	274	9.4%
Managed Care Y, Medicare N, Medicaid Y	192	6.6%
Managed Care Y, Medicare N, Medicaid N	41	1.4%
Managed Care N, Medicare Y, Medicaid Y	424	14.6%
Managed Care N, Medicare Y, Medicaid N	76	2.6%
Managed Care N, Medicare N, Medicaid Y	70	2.4%
Managed Care N, Medicare N, Medicaid N	65	2.2%

Given this distribution of physician participation across sectors, a four-group typology of participation was constructed:

- Those who participate in all three sectors (1,772 physicians, 60.8 percent);
- Those who participate only in managed care or in managed care and either Medicare or Medicaid, but not both of them (507 physicians, 17.4 percent);
- Those who do not participate in managed care, but do participate in either Medicare, Medicaid, or both of them (570 physicians, 19.6 percent); and
- Those who do not participate in any of these sectors (65 physicians, 2.2 percent).

Physicians who fall into group 1 may be considered "players": they are willing to participate in all sectors of the health care market in order to gain access to patients. Physicians in the second group are "selective players," who have agreed to participate in the newest sector of the market, managed care, but choose not to participate in one or the other of the public sector programs, or both of them. Those in group 3 may be considered "risk-averse," or "resistant to change," preferring to stay in those sectors of the market that are reimbursed on a fee-for-service basis. Finally, those in group 4 may be considered "non-players," who are either practicing fee-for-service medicine limited to patients with indemnity insurance, or employed by an institution that falls outside the managed care, Medicare, and Medicaid sectors (42.6 percent of the physicians in group 4 work for an institution). Specialties with a greater share of patients with limited insurance coverage, such as psychiatrists and plastic surgeons, are also more likely to fall into this group.

Polytomous (multinomial) logistic regression techniques were used to analyze the characteristics of physicians across these groups. Due to the small number of physicians in group 4, only the first three groups were used, resulting in a sample of 2,853 physicians. Participation in all three sectors (group 1, "players") was selected as the reference group because it has the most members, and because it represents what many would consider the ideal. Two equations were solved simultaneously:

Equation 1 models the probability of being in group 2 versus the reference group. That is, the probability of having only managed care contracts or having managed care contracts and participating in either Medicare or Medicaid, but not both, vs. participating in all three sectors.

Equation 2 models the probability of being in group 3 versus the reference group. That is, the probability of not having managed care contracts but participating with one or both of the public sector programs, vs. participating in all three sectors.

Relative Prices

Physicians with higher usual fees have increased odds of being "selective players," rather than participating in all three sectors.

Market Characteristics

Physicians in areas with higher HMO penetration rates (HMOPOP) face decreased odds of participating only in fee-for-service arrangements (group 3), rather than being in either of the managed care groups. Thus, physicians are responding to the level of demand in the managed care sector. Physicians in areas with greater income per capita (ARFPCI) face increased odds of being selective players (group 2) or remaining in the fee-for-service sector (group 3), rather than participating in all sectors. Physicians in urban areas are more likely to be selective participants, and less likely to remain only in the fee-for-service sector. Thus, physicians in rural areas are at increased odds of being in the fee-for-service sector, rather than being full participants (OR=1/.508=1.97, p=.0001) This may be a reflection of the low level of HMO market penetration generally found in rural areas, which HMOPOP may not capture adequately. As more Medicare and Medicaid beneficiaries move into managed care, access to managed care plans among rural residents may be a significant issue.

Practice Characteristics

Physicians who remain in the fee-for-service sector are relatively more likely to be in solo practice than in a group setting. Physicians in group practices are relatively less likely to be in the fee-for-service sector than in either of the groups with managed care contracts. These findings are consistent with the hypothesis that group practices are more compatible with managed care than solo practice. Physicians employed by an

institution have the greatest relative odds of remaining in the fee-for-service sector, followed by being in the reference group, and then in group 2.

Physician Characteristics

Physicians with more experience have higher odds than their less experienced colleagues of being in the fee-for-service sector (OR=1.35 per decade, p<.001), followed by group2 (OR=1.27 per decade, p<.001). Statistical tests indicate that these odds ratios are all significantly different from one another at conventional levels of significance. The same pattern of relative odds is found for female versus male physicians: fee-for-service only (group3), followed by participation in managed care only, or managed care and one of the public sector programs (group2), followed by participation in all three sectors (reference group). Regarding specialty, medical or "other" specialists have higher odds than general/family practitioners of being in cells other than the reference group. Uncertified physicians are more than twice as likely as certified physicians to be in the fee-for-service only group than the other two groups (OR=1/.444=2.25). Similarly, more altruistic physicians have increased odds of being e in the fee-for-service only sector. On average, a physician with 5 percent more uninsured patients than a similar physician is 16 percent more likely to be group 3 than in the reference group.

Summary

Although the majority of physicians in the sample participate in all three sectors of the health care market, a significant segment (approximately 40 percent) do not.

Comparing full participation with two alternative patterns of participation indicate differences among the physicians who are "players" versus those who choose to remain in sectors that reimburse fee-for-service, versus those who contract with managed care but are selective in their participation in public programs. On average, "players" have increased odds of working in urban areas with lower per capita income levels. These physicians are more likely to be male, general/family practitioners or surgical specialists in group practices. There are more likely to have graduated from medical school recently. In comparison, "selective players" tend to have higher average fees, and are more likely than "players" to be female, to have more experience, and to be medical or "other" specialists. "Selective players" are also more likely to practice in areas with higher per capita incomes. Physicians remaining in the fee-for-service sector are more likely than "players" to practice in areas with lower HMO market penetration and higher per capita incomes. Rural physicians are more likely than their urban counterparts to fall into this group. Solo practice physicians, as well as medical and "other" specialists, also have greater odds of remaining in the fee-for-service sector. Uncertified physicians are more than twice as likely as certified physicians to be in sectors that reimburse on a fee-for-service basis, as opposed to participating in all three sectors. Those with more uninsured patients in their practice also have increased odds of being in this group.

These differences suggest that physicians have different responses to the recent changes in the marketplace, or that they face different opportunities. The systematic differences by level of experience, certification status, and gender suggest that concerns regarding physician access to the managed care market may be warranted. However, this

research cannot reach a causal conclusion as to whether these differences reflect physician choices or managed care organization selection criteria. The differences by practice size suggest that the organization of medical practice is adapting to managed care, and that solo practice is no longer the standard. Finally, the results regarding the percent of uninsured patients in the physician's practice suggest either that altruistic physicians are staying out of managed care arrangements, or that those who participate in managed care are less able to serve uninsured patients. In either case, the implication is that as managed care becomes more prevalent, access to care for the uninsured will be constrained both by lack of insurance and by smaller numbers of physicians treating the uninsured.

Table 6.9 Participation Patterns: Direction of Effects

Reference Category is Group 1: MC Y MR Y MD Y

	Group 2	Group 3
Relative Prices		
Medicaid vs. private fees - MCDPRI	n.s.	n.s.
Medicare vs. private fees - MCRPRI	n.s.	n.s.
Physician's usual fee - FEEINDX	+	n.s.
Market Characteristics (MSA Level)		
Urban residence (50,000+) - URBAN	n.s.	-
Percent of pop. in HMOs - HMOPOP (a)	n.s.	-
1990 Percent of pop. age 65+ - ARF65 (a)	n.s.	n.s.
1992 Per capita income ($10,000) - ARFPCI92	+	+
Physician supply per 10,000 pop. - DOCPOP	n.s.	n.s.
Practice Characteristics		
Practice size:		
2-5 - N2TO5	n.s.	-
6+ 6PLUS	n.s.	-
Institutional employee - NINST	-	n.s.
Multi-specialty group - MULTI	n.s.	n.s.
Physician Characteristics		
Sex (1=female) - ZSEX	+	+
Decade graduated medical school - MEYRCAT1	+	+
Specialty:		
Medical specialties - SP4MED	+	+
Surgical specialties - SP4SUR	n.s.	n.s.
Other specialties- SP4OTH	+	+
Board certification status (1=certified) - CERT	n.s.	-
Percent of patients uninsured - PATUN	n.s.	+

Table 6.10 Participation Patterns: Results

Group 1 "Players"	Group 2 "Selective Players"	Group 3 "FFS Only"
Relative Prices	***Relative Prices*** Higher usual fees (1.03, p=.001) *	***Relative Prices***
Market Characteristics Lower per capita income Urban areas	***Market Characteristics*** Higher per capita income (1.71, p<.001)	***Market Characteristics*** Lower HMO market penetration (.96, p<.001)** Higher per capita income (1.28, p=.03) Rural areas (OT=1/.51=1.97, p=.03)
Practice Characteristics Group practices	***Practice Characteristics*** Not instit. employees (.69, p=.02)	***Practice Characteristics*** Solo practice
Physician Characteristics Male physicians Less experienced General/family practice Surgical specialties	***Physician Characteristics*** Female physicians (1.86, p<.001) More experienced (1.27, p<.001) Medical specialties (2.49, p<.001) "Other" specialties (1.92, p=.003)	***Physician Characteristics*** Female physicians (1.45, p=.01) More experienced (1.35, p<.001) Medical specialties (1.5, p<.001) "Other" specialties (2.1, p<.001) Uncertified physicians (2.25, p<.001) More uninsured patients (1.16, p<.001) **

* OR for 10 percentage point difference

** OR for 5 percentage point difference.

Chapter 7. Discussion

The 1990s have seen managed care organizations come to dominate the private insurance market. The Medicare and Medicaid programs have also begun to turn toward alternative arrangements for the financing and delivery of health care to their beneficiaries. The ramifications of these transformations — both positive and negative — are only beginning to be understood.

This analysis started from the premise that, given the central role physicians play in delivering health care, physician participation in different sectors of the health care market is an important issue for consumers, policy makers, insurers, and health care providers. Physician participation speaks to some of the most contentious health policy debates currently underway, such as the role and rights of physicians in a changing marketplace, access to care, and the adequacy of the safety net for the elderly, the poor, and the uninsured.

The model

A considerable health economics and health services research literature has accumulated to assess physician participation in the Medicaid programs. This research has been based on models that assume physicians maximize their utility, subject, in the short run, to the constraints of their local market. Building on this literature and on empirical findings from health services research, a model of participation was defined

that includes as predictors relative prices paid in each sector, other market conditions, and characteristics of physicians and their practices. This model was then applied to three sectors of the health care market — managed care, Medicare, and Medicaid — both individually and collectively.

The results confirm that a behavioral model rooted in economics is appropriate for analyzing physician participation. In each sector, relative price and/or demand factors showed the expected effect. However, in all but the Medicaid model, predictions regarding competition among physicians (as measured by the number of physicians per 10,000 population) did not hold. Instead, physicians in more competitive markets were less likely to have managed care and capitated contracts. These findings may reflect the degree to which managed care organizations select among physicians in areas with low versus high physician supply. When there are more physicians per capita, managed care organizations may feel that they can be more selective in their choice of physicians, while still ensuring a physician panel of adequate size. In areas with fewer physicians per capita, health plans may feel the need to contract with a larger percentage of them, in order to give enrollees a broad degree of physician choice. Data from specific managed care plans are needed to test this hypothesis.

As the conceptual model predicted, practice size was also an important explanatory variable across dependent variables. The conceptual model also predicted that physicians in multi-specialty groups would have greater participation with managed care and capitation arrangements. The empirical results found the expected positive

relationship with having a capitated contract, but a negative relationship with having a managed care contract. Among the physician characteristics, specialty, board certification, and years of experience generally all had the expected effect, and accounted for much of the difference among physicians for all of the dependent variables.

Physician altruism (as measured by the percent of patients uninsured) was a significant predictor in all of the models except for those regarding capitation. The importance of altruism as an explanatory variable indicates that physicians vary in their commitment to a social role of medicine, and that these beliefs affect decisions about which patients to treat. Altruistic physicians are less likely to have managed care contracts, less likely to serve Medicare patients, more likely to serve Medicaid patients, and more likely to remain in the FFS-only sector of the market. Given these results, it is clear that modeling physician behavior requires a multi-disciplinary approach.

While the appropriateness of the conceptual model is supported by the empirical results, the percent of variation explained by these variables varies with the dependent variables. The analyses of participation in Medicare achieved the highest pseudo-rsquare and r-square values (.53 and .29, respectively). Even in this model, however, a large portion of the variation in participation rates remains. This suggests that the results are reasonable estimates of means differences among groups of physicians. Prediction regarding the participation of a particular physician, however, is not appropriate. The statistical model had the lowest predictive power for the percent of revenues from capitation. This may be because of the apparent lack of knowledge among survey

physicians about capitation arrangements. It is also possible that important variables were missing from the model.

The changing role of the physician

Physicians are, perhaps, the central element of medical care. As the insurance sector has transformed from one based on indemnity insurance and FFS payment to one with alternative payment methods and more controls over physicians, however, physician autonomy and control have declined. Instead of deciding what fees to set, the choice now facing physicians is increasingly that of participation. Will a given physician participate in a sector of the health care market characterized by changing payment systems and increased scrutiny of medical practice? Or is it preferable to see only patients insured by less-intrusive payers that still use FFS payment systems? Is it possible to maintain a fee-for-service-only practice?

This study indicates that the majority of physicians (60 percent) participate in managed care, Medicare, and Medicaid. However, a significant proportion (about 40 percent) do not. Economic factors appear to be at work. Physician participation in a sector is correlated with the relative fees paid in that sector and the level of demand in that sector versus others. Important practice and physician characteristics are also involved: those most likely to stay in the FFS-only sectors of the market are, on average, in solo practice, more experienced, without board certification, and living in rural areas.

Historically, the dominant mode of medical practice in the U.S. involved self-employed physicians working in solo practice. The organization of medical practice has been changing (Kletke, et. al. 1998; Kletke, et. al. 1996), however, toward more group practices and a greater reliance on physician employees. This study indicates that these organizational structures are also associated with physician participation in managed care and capitation arrangements. While no causal inference can be made from a cross-sectional study, it is likely that the growth of alternative forms of insurance have had an impact on physician organization. Managed care and capitation arrangements generally require more sophisticated administrative systems than indemnity insurance. Groups are more likely to have such systems in place. Having a larger number of physicians who can treat a larger share of a health plan's enrollees may also increase the negotiating power of group versus solo practices.

Access to patients

A key concern of physicians is the extent to which managed care maintains a level playing field. Do all physicians who want to see patients insured by MCOs have access to the managed care sector of the market? Are the physician selection criteria used by MCOs fair? Is there evidence of discrimination against certain types of physicians? These questions are behind recent initiatives to pass "any-willing-provider" legislation, which would allow physicians to participate in any health plan, as long as they meet the plan's stated criteria (Miller 1997).

While this analysis cannot differentiate between managed care plans' decisions versus those of physicians themselves, differences in participation with managed care do appear by years of experience, board certification status, gender, and specialty. Uncertified physicians and those with more experience are less likely to participate in managed care and capitation arrangements. Women who have managed care contracts obtain, on average, a smaller percentage of their revenues from managed care than their male counterparts. In general, primary care physicians are more likely to be involved with managed care and capitation than specialists. In addition, the findings regarding physician supply suggest that managed care organizations may be more selective in areas with more physicians per population.

These differences may reflect either physician choice or the selection criteria used by MCOs. If the latter is the case, a fine line must be drawn between criteria, such as specialty, that serve the MCOs' interests, and those, such as years of experience or gender, that may reflect discrimination. Finally, characteristics such as board certification status may be legitimate criteria, to the extent that they reflect quality, that have unexpected consequences for certain groups of physicians (e.g., older physicians) that are less likely to have board certification. The results of this study indicate that differences in participation by characteristics of the physicians remain after controlling for demand in the managed care sector of the market. Thus, while it is beyond the scope of this analysis to determine the extent of physicians "rights" to have access to patients, there is some support for those who contend that any-willing-provider legislation is

needed to ensure a fair playing field for all physicians. Further research is required, however, to determine if these differences are due to physician choice or MCO selection.

Access to care

For consumers and policy makers, access to care for members of managed care plans and public sector beneficiaries are important issues. For the general public, access to needed specialists and qualified physicians is paramount. The study indicates that access to physicians may be a problem in rural areas. Even after accounting for HMO market penetration, rural physicians are less likely to contract with managed care, suggesting that rural health plan enrollees may have difficulty finding physicians close to them.

For Medicare beneficiaries, the findings regarding physicians' years of experience are troubling. More experienced physicians, have, on average, more patients who are Medicare beneficiaries, but they are less likely to participate in managed care. Thus, Medicare beneficiaries might find they can no longer access their usual source of care if they move to managed care. It is possible, of course, that when Medicare beneficiaries move into managed care plans, their physicians will decide to contract with managed care, rather than staying in the fee-for-service-only sector. Longitudinal data is needed to test this hypothesis.

For Medicaid beneficiaries, the results confirm access issues that have emerged in previous studies. Those specialties most in need for the bulk of Medicaid beneficiaries

(pregnant women and children) — general/family practitioners, pediatricians and obstetrician-gynecologists — are actually less likely than surgeons and internists to provide Medicaid services. However, among physicians with Medicaid patients, the primary care physicians have a larger Medicaid patient load. This suggests that continued efforts are needed to increase participation by primary care physicians and to ensure access to primary care for Medicaid beneficiaries.

Placing Medicaid beneficiaries in program-sponsored managed care plans may be one way to increase access to care, as long as physicians participate in managed care. Results from the Arizona program suggest that this may be a valid strategy (Silverstein 1997; Silverstein and Kirkman-Liff 1995). However, findings from this analysis indicate that physicians who participate in managed care have, on average, a smaller Medicaid patient load. In addition, experience from Tennessee suggests that physicians will resist efforts to tie provision of services to Medicaid recipients to provision of services to other patients (Watson 1995).

Historically, many Medicaid beneficiaries have relied on hospital outpatient departments and emergency rooms for care. Reflecting this, physicians who are employed by an institution were found to be more likely to serve Medicaid beneficiaries, and to have greater Medicaid patient loads. These same physicians, however, are less likely than others to have managed care contracts. Thus, special attention should be paid to ensuring that these traditional providers of care to Medicaid beneficiaries are included in Medicaid managed care programs. Incorporating traditional Medicaid and safety net

providers has been one focus of debates over increased use of managed care in Medicaid (Epstein 1997; Lipson 1997; Lipson and Naierman 1996; Schauffler and Wolin 1996). While the results of this study are suggestive for institutional providers of care for Medicaid recipients, the small number of physicians working in community health centers and public health clinics in the data set limits analysis regarding traditional providers in a clinic setting.

While the percent of uninsured patients was used primarily as a proxy for physician altruism, the findings have troubling implications for access to physician services among the uninsured. Physicians with managed care contracts are less likely to provide services to the uninsured, and have, on average, a smaller percentage of uninsured patients in their practices. While access to care for the uninsured is limited by financial barriers, these findings suggest that additional barriers are being raised as more physicians contract with managed care plans. This finding is consistent with recent research which found that access to care for low-income uninsured individuals is lower in states with higher Medicaid managed care penetration (Cunningham 1999).

Strengths and weaknesses

The study benefits from a number of strengths. It applies a model of physician participation to three sectors of the health care market at the same time — something that has not been done in the previous literature on physician participation. While this broad scope allows for comparisons across sectors, it also limits the depth of analysis of each individual sector. Other strengths of the study include the use of multivariate and

polytomous (multinomial) logistic regression techniques that allow consideration of market variables, as well as characteristics of the physician and his/her practice. While considerable survey data has been published on managed care and capitation contracting, little multivariate research has been published. The study also benefits from the use of data that come from a national survey of physicians.

While the AMA SMS is one of the best physician surveys available, it is not without flaws. Many of the weaknesses of the study arise from problems with the data.

First, the data are cross-sectional and represent a single point in time. Therefore, conclusions can only be drawn about associations between the response variables and the predictors. Causality cannot be inferred. Similar studies using time-series data would provide a more complete picture of how physicians are responding to a changing health care system.

Second, the external validity of the study results cannot be assured, given that the survey suffers from nonresponse bias. The use of weights to adjust for nonresponse by specialty, gender, years since graduating medical school, AMA membership and board certification status should mitigate this problem. Nonetheless, the response rate of 61 percent leaves open the possibility that results could be biased to the extent that nonrespondents differ from respondents in their participation patterns for managed care, Medicare, and Medicaid.

Third, omitted variable bias may exist, given that no relative price information was available for managed care. Assuming that managed care generally reimburses physicians at a level between Medicare and the physician's charge (PPRC 1996), the relative effect of Medicare and Medicaid in comparison to managed care is slightly less than the effect measured by the ratios of Medicare and Medicaid fees to the private sector. In addition, the relative price variables that were used are ecological in nature. Other measurement issues arise from the crude measures of HMO market penetration and the level of Medicaid demand.

Fourth, no measure was available to adjust for the case-mix of physicians. This could confound results regarding participation in managed care and capitation, given that physicians with a larger percentage of sick patients, or patients who are, on average, more seriously ill will be less likely to accept financial risk for patient care in the absence of adequate risk adjustment.

Fifth, the variable used as a proxy for altruism, the percent of patients uninsured, may introduce some measurement error. Although the majority of uninsured persons are poor and near poor (Bennefield 1998), not all of a physician's uninsured patients will be poor. Certain specialties, such as psychiatrists and plastic surgeons, provide services that generally have limited coverage. Nevertheless, to the extent that altruistic physicians are more likely to participate in the Medicaid program, the positive association between the percent of uninsured patients and Medicaid participation gives empirical evidence that the percent of uninsured patients is an adequate proxy for altruism.

Sixth, although these were the most recent data available at the time this study began, they were collected in 1994. More recent data would be useful in drawing conclusions relevant to future policies. This study may serve as a benchmark, however, in any analyses of more recent changes in physician participation patterns. Given the large percent (92) of physicians with at least one managed care contract in the AMA's 1997/98 SMS, future studies should focus more on measures of the extent of participation, such as the percent of revenues from managed care, or the number of contracts held.

Finally, the study naively assumes that the Medicare and Medicaid markets are separate from the managed care market. In 1993, however, about 5 percent of Medicare beneficiaries were in managed care plans (Iglehart 1999), and 15 percent of Medicaid beneficiaries were in some type of managed care (HCFA 1997). This assumption should not bias the results regarding the intersection of managed care and the public sector programs, however, as physicians treating Medicare or Medicaid beneficiaries should have indicated participation in both sectors. Nevertheless, a more direct analysis of physicians participating in public sector managed care programs would be desirable. The AMA's 1997/98 SMS ask specifically about participation in Medicare and Medicaid managed care plans. Assuming these data are of reasonable reliability and validity, analysis of these data would further elucidate policy issues that arise from increased use of managed care in the public sector programs.

Conclusion

This study demonstrates the expansion of physician participation models to analysis of participation in managed care, capitation arrangements, and patterns of participation with the various sectors of the market for physician services. The research upheld economic theories, by and large, but also demonstrated the importance of noneconomic factors, such as altruism. The majority of physicians participate in all sectors, but a substantial proportion limit their participation in some way. Approximately 20 percent do not participate with managed care at all. Differences in rates of participation by individual physician characteristics raise questions about the selection criteria used by MCOs when they form provider panels. Potential access problems are identified for Medicare and Medicaid beneficiaries, particularly as these programs increase their use of managed care to deliver health services to their beneficiaries. A strong, negative association was also found between participation in managed care and provision of services to the uninsured.

Appendix 1:

Unit Nonresponse in the AMA SMS

Appendix 1. Unit Nonresponse

Response Rates for SMS Survey by Demographic and Practice Characteristics

	Response Rate		*Sample Size*		*Overall Response*
	Initial	*Reinterview*	*Initial*	*Reinterview*	*Rate*
All Physicians	57.9%	76.1%	4650	1862	63.1%
Years Since Graduating Medical School					
0-9	58.2%	73.5%	1638	680	62.7%
10-19	57.1%	74.9%	1412	542	62.0%
20-29	59.6%	80.7%	976	405	65.8%
30-39	57.6%	78.9%	394	180	64.3%
40 plus	52.1%	83.8%	117	37	59.7%
Specialty					
General/Family Practic	53.9%	76.7%	611	212	59.8%
Internal Medicine	51.0%	67.9%	1040	374	55.5%
Surgery	60.6%	76.1%	945	410	65.3%
Pediatrics	63.9%	83.6%	346	152	69.9%
Obstetrics/Gynecology	60.7%	78.1%	305	123	65.7%
Radiology	66.6%	83.7%	275	123	71.9%
Psychiatry	56.2%	78.7%	340	108	61.6%
Anesthesiology	59.7%	71.3%	295	122	63.1%
Pathology	68.7%	80.8%	99	73	73.8%
Other	60.2%	79.4%	394	165	65.9%
Board Certification Status					
Certified	60.1%	76.3%	3679	1573	65.0%
Not Certified	49.5%	75.1%	971	289	55.4%
AMA Membership					
Member	0.674	0.794	1769	874	71.4%
Nonmember	0.521	0.732	2880	988	57.5%

Source: Adapted from Appendix B, Table 1 of Socioeconomic Characteristics of Medical Pr

Appendix 2:

Summary of the AMA SMS Questionnaire

Socioeconomic Monitoring System Questionnaire Summary

This summary contains questions from the American Medical Association's Socioeconomic Monitoring System (SMS) survey that relate to the statistics published in *Socioeconomic Characteristics of Medical Practice*. Since the questionnaire is quite lengthy, some questions have been omitted from the summary, while others have been paraphrased. In some instances, parts of questions that are paraphrased have been enclosed with square brackets. Sentences in parentheses were used only when it was deemed necessary to clarify a particular survey question. All questions are from the 1994 SMS survey unless otherwise noted.

Screener Questions

1. [The American Medical Association Physician Masterfile indicates that (name physician's specialty)] is the specialty from which you derive most of your medical income. Is that correct?

   (IF "YES," GO TO QUESTION 2)

   a. What is your primary specialty?

2. During a typical week, do you provide direct patient care for 20 hours a week or more? Direct patient care includes seeing patients and performing surgery, as well as related patient services performed by anesthesiologists, radiologists, and pathologists.

3. Are you currently a full-time, salaried employee of a federal agency such as the U.S. Public Health Service, Veterans Administration, or a military service?

Practice Characteristics

4. Are you a full or part owner of your main practice, an employee of the practice, or an independent contractor?

5. Including yourself, how many physicians are in your main practice?

   a. How many physicians are full or part owners of the practice.

6. In what year did you begin medical practice after completing your undergraduate and graduate medical training?

7. In what year did you start working at your current main medical practice?

Hours and Utilization of Physician Services per Week

The next few questions are about the number of hours you spent working at several medical and administrative activities during your most recent complete week of practice. Do not include hours spent on call if you were not actually working.

All specialties except psychiatry, radiology, anesthesiology, and pathology

8. During your [last] complete week of practice, how many hours did you spend:

   a. In the office or in freestanding primary or urgent care centers seeing patients? (Include time spent in all offices if the practice includes multiple offices.)

   b. In the hospital emergency room and in outpatient clinics?

   c. In the operating, labor, or delivery room? Please include waiting time before surgery.

   d. Making hospital rounds, including visits to newborn infants? (Do not include hours spent on call if you were not actually working.)

e. On house calls and with patients in nursing homes, convalescent homes, or other extended care facilities?

f. Having telephone conversations with patients or their families, consulting with other physicians, and providing other services to patients such as interpreting lab tests and x-rays?

g. In administrative activities connected with your practice and other medical facilities, as well as any other professional activities that did not involve patient care?

9. During the [number] of hours you spent in the office or in freestanding or urgent care centers [in your last complete week of practice]:

   How many patient visits did you personally have? Please count as one visit every time you saw a patient.

10. During the [number] hours that you spent [in your last complete week of practice] in hospital emergency rooms and outpatient clinics located in hospitals:

    How many patient visits did you personally have? Please count as one visit every time you saw a patient.

11. During the [number] hours that you spent seeing patients on house calls, in nursing homes, convalescent homes, and other extended care facilities:

    How many patient visits did you personally have? Please count as one visit every time you saw a patient.

12. During the [number] hours that you spent in the operating, labor, or delivery room, how many operations and deliveries did you perform. Do not include assists.

13. How many assists did you perform during [your last complete week of practice].

14. During [your last complete week of practice], how many inpatient visits did you make during the [number] hours spent on hospital rounds?

    Please count as one visit every time you saw a patient.

Fees for Selected Visits

All specialties except psychiatry, radiology, anesthesiology, and pathology

15. Does your practice provide at least some medical care on a fee-for-service basis?

Probe: [Fee-for-service means that the physician] charges patients fees for specific medical services rather than charging a lump sum or premium for comprehensive medical services in HMOs and on a fee-for service basis in other settings.

(IF "NO," GO TO QUESTION 17)

16. What do you typically charge a privately insured patient for:

    a. An office visit with a new patient including an evaluation history, examination, and medical decision-making - CPT 99201-99205?

    b. An office visit with an established patient including an examination, evaluation, and medical decision-making - CPT 99211-99215.

    c. Subsequent hospital care when you charge a separate fee for hospital visits - CPT 99231-99233.

Hospital Utilization

All specialties except radiology, anesthesiology, and pathology

17. During your most recent complete week of practice, how many patients did you personally discharge from the hospital?

18. Among those patients that you discharged in that week, what was [their average length of stay in days]?

1993 Income, Expenses and Weeks Worked

Self-employed physicians only

19. Do you share some expenses with other physicians?

20. [In 1993, what (were your/was your share of your practice's)[1] total tax-deductible professional expenses for the following items to the nearest $1,000?]:

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[1] First wording in parentheses is used for physicians in solo practice. second wording is used for physicians in non-solo practice.

a. Professional medical liability or malpractice insurance premiums.

b. Office expenses, including rent, mortgage interest, depreciation on medical buildings used in your practice, utilities, and telephone.

c. Total nonphysician payroll expenses including fringe benefits.

d. Medical materials and supplies, such as drugs, x-ray films, and disposable medical products. Do not include expenses for office supplies in your answer.

e. Depreciation, leases, and rent on medical equipment used in the diagnosis and treatment of patients. Do not include expenses for office equipment and furniture. Do not include the total purchase price or the replacement value of your medical equipment. Please report only that proportion that was tax-deductible in 1993.

f. Other professional expenses, such as legal services, accounting services, office management services, professional association memberships, journals and continuing education, professional car upkeep and depreciation, and any other professional expenses [not mentioned].

All physicians

21. During 1993, what was your own net income from medical practice to the nearest $1,000 after expenses but before taxes? Please include all income from fees, salaries, retainers, and other forms of compensation.

22. Does that include income from investments in medical-related enterprises independent of your medical practice, such as medical labs or imaging centers?

    (IF "NO" GO TO QUESTION 24)

23. How much were the investment earnings included in net income for 1993?

24. Were any contributions made into pension, profit-sharing, or deferred compensation plans for you during 1993?

    (IF "YES," ASK PARTS a. AND b.)

    a. How much was contributed for you to the nearest $1,000?

    b. Did you include this amount in your [number] net income figure for 1993?

25. Did you receive any income in bonuses in 1993?

25a. To the nearest $1000, how much of your income was paid in bonuses?

26. Did you receive any income in salaries in 1993?

26a. To the nearest $1000, what was your income from salaries in 1993.

27. During 1993, how many weeks of medical practice did you miss because of:

    a. illness or vacation, military service, professional conferences or any other reason?

    b. Altogether then, you missed [Number] weeks of practice and practiced [Number] weeks?

    c. (If physician began practice in 1993). Excluding [Number] of weeks of practice you missed in 1993 due to illness or vacation, military service, professional conferences, or any other reason, for how many weeks did you practice in 1993?

Professional Liability

28. Have any malpractice claims been filed against you during your career?

    (IF "NO" GO TO QUESTION 32)

29. How many malpractice claims have been filed against you during your career?

30. How many of these [number] claims were filed during the last five years?

    (IF 0 GO TO QUESTION 32)

31. How many of these claims were filed against you during the last twelve months?

Self-employed physicians who purchased liability insurance

32. What is the current annual limit on your total

malpractice liability coverage? (Total annual limit would be equivalent to the limit on multiple occurrences.)

33. What is the current limit on your malpractice liability coverage per case? (The amount per case would be for a single occurrence.)

Managed Care

All physicians except employees of Health Maintenance Organizations (HMOs)

34. The next few questions concern a variety of managed care contracts that you or your practice may have. Managed care plans include, but are not limited to, HMO's, PPO's, and IPA's. Do you or does your practice have any managed care contracts?

DEFINITION: Managed care plans are distinguished by the use of financial incentives or specific controls to limit utilization to a set of specific providers, services, or sites. Prior authorization review and other utilization review may also be characteristic of these plans.

(IF "NO" GO TO QUESTION 46)

35. What percentage of your practice revenues are obtained under all managed care contracts combined?

(IF 0 GO TO QUESTION 46)

36. Now considering only your managed care revenues, what percentage of these are earned on a capitated basis?

DEFINITION: Capitation refers to an arrangement where payment for medical services is prepaid and does not vary with the number or type of services provided.

37. Again, considering only your managed care revenues, what percentage of these are subject to a risk pool withhold?

DEFINITION: Withholds entail the retention of a percentage of the physician's payment. The portion of the withhold that is later returned is tied to the financial performance of the managed care plan.

38. Do you or your practice have a contract with a preferred provider organization, or PPO?

DEFINITION: A PPO markets the services of a select panel of health care providers. Care is generally provided on a fee-for-service basis to patients. Fees are contractually established between the PPO and each participating provider. (Patients are free to obtain care from any provider in the panel. Patients may face higher copays or other economic penalties if they obtain care from providers not in the panel).

39. Do you or does your practice have a contract with an individual practice arrangement, or IPA?

DEFINITION OF AN IPA: Under an IPA plan, an HMO markets the services of a select panel of individual providers. Under IPA plans, physicians' practices are typically paid on a fee-for-service basis by the HMO. While patients have choice within the panel of a primary care provider, they have to obtain referrals to see specialists. Patients are effectively locked into the panel. (An individual practice arrangement is an IPA under this definition.)

(IF NO, NOT A MEMBER OF AN IPA, GO TO QUESTION 41)

40. Excluding IPA arrangements, do you or does your practice have a contract with a health maintenance organization or HMO?

DEFINITION: An HMO markets the services of a select group of providers. The panel may be open or closed. Under HMO plans, physicians' practices are generally paid fixed or capitated amounts by the HMO. Patients are usually locked into a panel of providers, and typically must receive referrals from primary care physicians to see specialists. (Please do not include any IPA arrangements in your answer to this question.)

(GO TO QUESTION 42)

41. Do your or does your practice have a contract with an HMO?

DEFINITION: An HMO markets the services of a select group of providers. The panel may be open or closed. Under HMO plans, physicians' practices are generally paid fixed or capitated amounts by the HMO. Patients are usually locked into a panel of providers, and typically must receive referrals from primary care physicians to see specialists.

If physician or physicians practice has PPO contract

42. What percentage of your practice revenues are obtained under contracts with PPO's?

If physician or physician's practice has IPA contract

43. What percentage of your practice revenues are obtained under IPA contracts?

If physician or physician's practice has HMO contract

44. What percentage of your practice revenues are obtained under HMO contracts?

All physicians with contracts

45. Now I want to ask the form of payment to the practice and to you personally. (Your form of payment may differ from the basis upon which your practice is paid.)

If physician or physicians practice has PPO contract

a. How is your practice paid under its primary PPO contract: on a fee-for-service, capitated, or other basis?

b. Under your primary PPO contract, are your personally paid on a fee-for-service, capitation, or salaried basis?

If physician or physicians practice has IPA contract

c. How is your practice paid under its primary IPA contract: on a fee-for-service, capitated, or other basis?

d. Under your primary IPA contract, are you personally paid on a fee-for-service, capitation, or salaried basis?

If physician or physicians practice has HMO contract

e. How is your practice paid under its primary HMO contract: on a fee-for-service, capitation, or salaried basis?

f. Under your primary HMO contract, are you personally paid on a fee-for-service, capitation, or salaried basis?

Nonphysician Practitioners

All self-employed solo and group practice physicians and employees of HMOs, group practices, and free-standing care centers.

If practice employs nonphysician personnel

46. How many of the [number] non-physician personnel [employed by your practice] were physician assistants?

47. How many of the [number] non-physician personnel were nurse-midwives?

48. How many of the [number] non-physician personnel were nurse practitioners?

49. How many of the [number] non-physician personnel were clinical nurse specialists?

Charity Care

50. Charity care is provided for free or at reduced fees due to the financial need of the patient. During your most recent complete week of practice, did you provide any charity medical care? (Do not include Medicare or Medicaid or bad debt as charity medical care.) (Bad debt refers to provided services for which payment was expected but never received.)

    (IF "NO" skip remaining questions)

51. During that week, how many hours were spent providing free charity care, including related services and administrative activities?

52. Next, how many hours that week were spent providing reduced fee charity care, including related services and administrative activities?

If physician is self-employed and in solo practice

53. To the nearest $1,000 what were your bad debts for services rendered in 1993? (Bad debt refers to provided services for which payment was expected but never received.)

If physician is self-employed and in group practice

54. To the nearest $1,000 what was your share of the practice's bad debts for services rendered in 1993? (Bad debt refers to provided services for which payment was expected but never received.)

Appendix 3:

Summary of Relative Price Variables by Census Division

Appendix 3

Summary of Relative Price Variables by Census Division

Census Division	Avg. MCDPRI	min	max	Avg. MCDMCR	min	max	Avg. MCRPRI	min	max
New England	0.604	0.450	0.700	0.835	0.650	0.98	0.725	0.692	0.812
Mid-Atlantic	0.347	0.280	0.460	0.442	0.320	0.610	0.801	0.702	0.875
East North Central	0.627	0.55	1.000	0.769	0.65	1.25	0.820	0.765	0.892
West North Central	0.671	0.490	0.960	0.911	0.680	1.13	0.735	0.683	0.850
South Atlantic	0.673	0.360	0.830	0.895	0.410	1.12	0.766	0.651	0.964
East South Central	0.693	0.560	0.810	0.884	0.740	1.07	0.786	0.757	0.831
Wast South Central	0.845	0.680	0.880	1.051	0.860	1.17	0.804	0.684	0.822
Mountain	0.675	0.590	0.840	0.946	0.860	1.25	0.716	0.663	0.874
Pacific	0.517	0.490	0.940	0.639	0.590	1.14	0.814	0.747	0.831

Source: Adapted From Holahan, et. al. 1990

Appendix 4:

Data Imputation

Appendix 4:

Data Imputation

Missing data points were imputed for 3 variables central to the analysis: the number of physicians in the practice (DOCNUM), the percent of patients uninsured (PATUN), and the physician's standard fee for an office visit for an established patient (POLD). Of the analytic sample of 2,914 physicians, complete information was available for 2,425 (83.2%). Among the remaining 489 physicians, 447 (15.3% of the sample) lacked information on only one of the three variables, 41 (1.4% of the sample) were missing two of the three, and only 1 physician was missing all three. To make use of the additional information available for all of the other variables, values for missing data points were imputed.

Number of physicians in the practice (DOCNUM). This variable was missing for 549 (18.8%) of the 2,914 physicians included in the analysis. Of these physicians, 520 (17.8% of the sample) were physicians employed by private hospitals, medical schools, a university or college, a local/state government, or other employer. Since these physicians work for institutions, rather than in a practice setting, they are identified by a dummy variable (MDINST). Of the remaining 29 physicians missing DOCNUM (1.3% of the sample), 1 has an ownership interest in his/her practice and the others are employees. The employees with missing information were assigned a random value based on the proportion of the employees with information on DOCNUM that took that value, as shown in Table A4.1 below. Random assignment was chosen over regression techniques

because the variable has a categorical distribution, with ordinal values from 1-10 and categorical values for larger practice sizes (e.g., 11-20, 21-40, etc.). It is preferred to assignment of the mean value because it retains variability. The one owner missing information on DOCNUM was assigned the mean value for owners (3). The imputed DOCNUM variable was then used to create a series of categorical variables indicating practice size (solo, 2-5, 6-10, 11+) that, together with MDINST, represent all physicians in the analysis.

Table A4.1. Assignment of values for observations missing DOCNUM

Value	Percent
1	.0272
2	.0657
3	.0566
4	.0453
5	.0351
6	.0204
7	.0159
8	.0136
9	.0125
10	.0102
11-20	.0306
21-40	.0204
41+	.0589
Instit.	.5878
Total	1.00

Percent of uninsured patients in the practice (PATUN). This variable was missing for 101 (3.5%) of the physicians included in the analysis. Records missing PATUN were assigned the mean value by specialty of those for whom PATUN was observed. Specialty was chosen as a classification variable because significant variation by specialty can be expected. For instance, children are more likely to be uninsured than any other age group; therefore pediatricians should have a higher than average proportion of uninsured. In addition, many individuals do not have insurance coverage for mental

health services; thus, the proportion of uninsured should be higher for psychiatrists. As can be seen in table A4.2, variation in the proportion of uninsured by specialty was seen among those with observed information on this variable. Assigning the mean by specialty limits the extent of bias introduced through interpolation and decreases the variability of PATUN. A more restrictive approach, assigning the mean value of the entire observed population to those missing PATUN, would further restrict the variability. The mean values by specialty are shown below. Regression analysis to predict PATUN was also explored, but low r-square values (approx. 0.10) were found. Mean value by specialty was chosen over prediction by regression analysis because of its simplicity and transparency.

Table A4.2. Assignment of values for observations missing PATUN

Specialty	n	No. missing PATUNINS	Mean value of observed
General/Family Practice	435	20	12.1180
Internal Medicine	462	12	7.3822
Int. med. Subspec.	212	5	4.9227
General Surgery	227	4	7.7623
Surgical Subspec.	586	15	6.4676
Pediatrics	295	11	10.0598
Obstetrics-Gynecology	252	8	7.6147
Psychiatry	246	12	14.8798
Other	200	14	9.1451

Usual fee for an established patient (POLD). This variable was missing for 736 (25.2%) of the physicians included in the analysis. Of these, 145 (5.0% of the sample) were ophthalmologists and 245 (8.4% of the sample) were psychiatrists. For the ophthalmologists, the value for another variable, the typical fee for an ophthalmologic

visit for an established patient (POPHOLD) was used to represent the usual fee. For the psychiatrists, the typical fee for a psychotherapy session with an established patient (PIMP) was used to represent the usual fee. This variable was missing for 60 psychiatrists, who were assigned the mean value of PIMP for the observed psychiatrists (122.87). For the remaining 345 physicians (11.8% of the sample) missing fee information, the mean value by specialty was assigned. Specialty was chosen as a classification variable because differences in the mean fee for an office visit can be expected by specialty. For instance, physicians in primary care generally have lower fees than specialists. Furthermore, the distribution of fee information by specialty was found to be approximately normal (data not shown), while the distribution over all physicians was right skewed. Exploratory analysis indicated that specialty explained 30 percent of the variation in fee information as the explanatory variable in Anova regression analysis (data not shown). Regression analysis with additional variables added only 0.04 to the r-square (data not shown). Given the low predictive power of additional variables, mean values by specialty were chosen for their simplicity and transparency. Table A4.3 shows the mean values of the usual fee for an office visit by specialty.

Table A4.3 Assignment of values for observations missing usual fee information

Specialty	n	No. missing fee info	Mean value of observed
General/Family Practice	462	60	43.8781
Internal Medicine	480	70	60.9463
Int. Med. Subspec.	221	20	62.805
General Surgery	232	29	53.4975
Surgical Subspec. (excl. oph)	452	56	51.9747
Ophthalmologists	149	0	64.4765
Pediatrics	307	76	49.2770
Obstetrics-Gynecology	258	24	63.6581
Psychology	260	66	122.3298
Other	205	40	63.1030

After interpolation, an index variable was created, whereby the value of each physician's usual fee was divided by the mean of the group by specialty. This new variable, FEEINDX, eliminates the difference in fees across specialties and represents the fee of a given physician versus others in his/her specialty. For physicians with imputed fees, the index variable is 1.0. This configuration, which decreases the standard deviation of the fee variable, will bias the coefficient in the analysis toward zero.

Appendix 5:

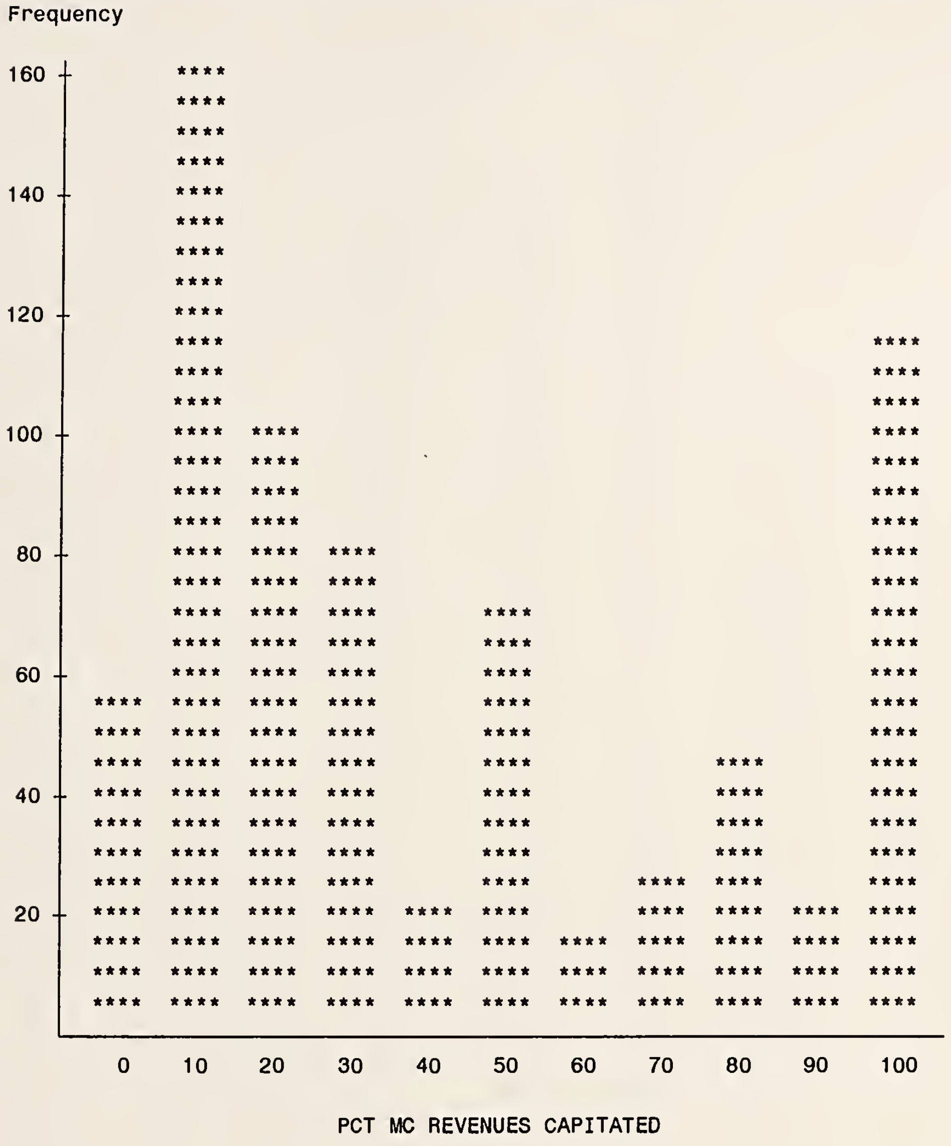
Collinearity of OWN and Practice Size Variables

Appendix 6:

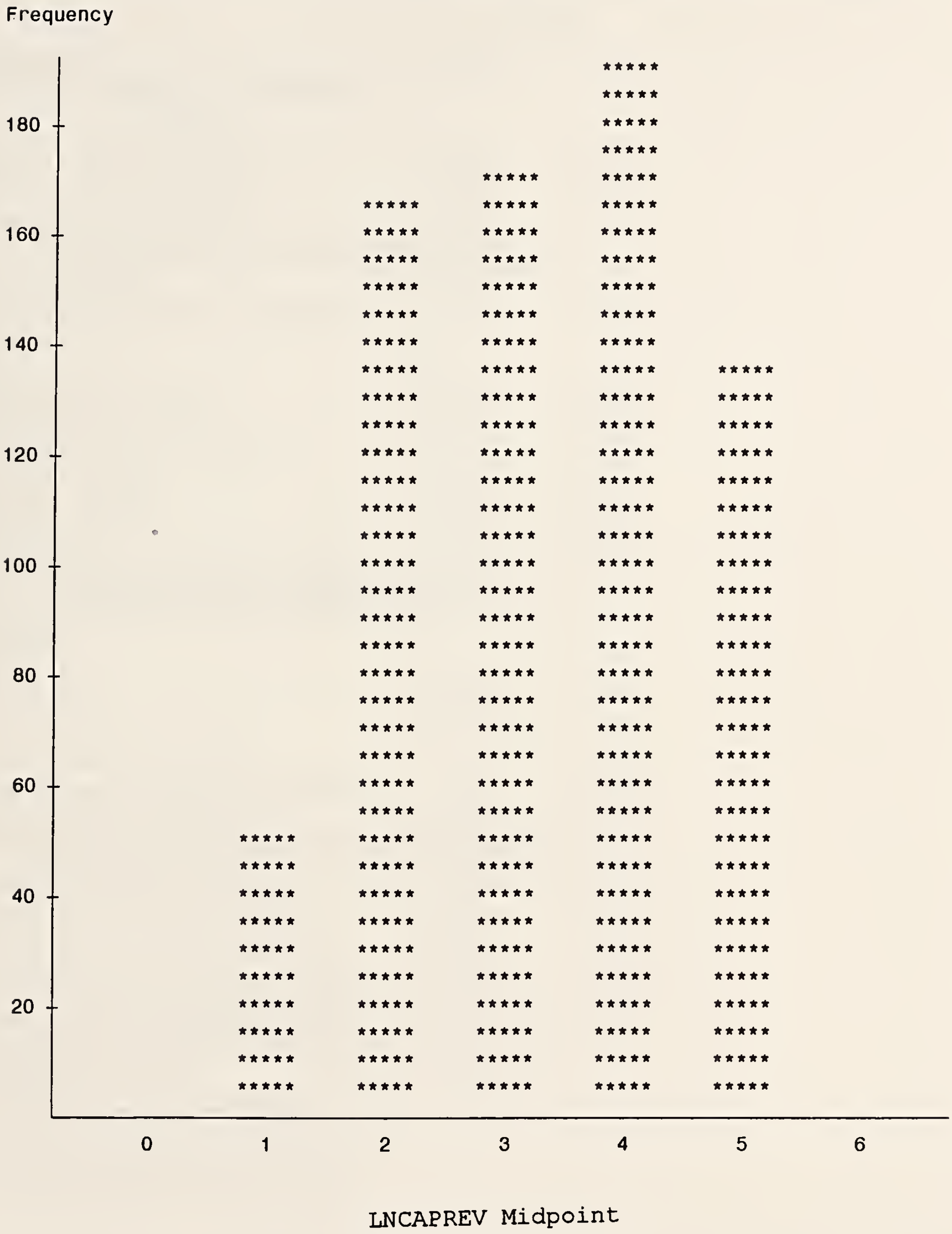
Natural Log Transformation of Percent Managed Care Revenues Capitated (CAPREV)

Appendix 6:

Log Transformation of Percent of Managed Care Revenues Capitated (CAPREV)



Appendix 6:
Log Transformation of Percent of Managed Care Revenues Capitated (CAPREV)



Appendix 6

Table A6.1 - Regression Results for Log Transformation of Percent Managed Care Revenues Capitated (LNCAPREV)

Variable (Name)	LNCAPREV coeff.	s.e.
Independent Variables - Comparative Fee Information		
Medicaid vs. private fees - MCDPRI	-0.619	0.3635
Medicare vs. private fees - MCRPRI	1.3357	1.2971
Physician's usual fee - FEEINDX3	-0.005	0.1184
Independent Variables - Physician Characteristics		
Sex (1=female) - ZSEX	-0.236 *	0.1169
Decade graduated medical school - MEYRCAT1	-0.014	0.0438
Specialty:		
Surgery - SP11SUR	0.1194	0.1401
Internal medicine - SP11IM	0.0178	0.1157
Obstetrics/gynecology - SP11OBG	0.1048	0.1683
Pediatrics - SP11PED	0.1018	0.1464
Psychiatry - SP11PSY	0.368	0.2621
Other - SP11OTH	-0.068	0.2099
Board certification status (1=certified) - CERT	-0.155	0.1113
Independent Variables - Practice Characteristics		
Practice size:		
2-5 - N2TO5	-0.157	0.1143
6-10 - N6TO10	0.0235	0.1705
11+ - N11PLUS	0.4111 *	0.1871
Institutional employee - NINST	0.5144 ***	0.1286
Percent of patients uninsured - PATUNEW3 (a)	-0.207	0.4053
Multi-specialty group - MULTI	0.2274	0.1465
Independent Variables - Market Characteristics (MSA Level)		
Urban residence (50,000+) - URBAN	-0.299	0.1775
Percent of pop. in HMOs - HMOPOP (a)	0.2626	0.1433
1990 Percent of pop. age 65+ - ARF65 (a)	0.8778	1.3231
1992 Per capita income ($10,000) - ARFPCI92	-0.083	0.1044
Physician supply per 10,000 pop. - DOCPOP	-0.432 *	0.1788
Hosmer-Lemeshow goodness-of-fit test (p-value)		
R-Square/Pseudo r-square	0.058	

* Statistically significant at the .05 level.

** Statistically significant at the .01 level.

*** Statistically significant at the .001 level.

Appendix 7:

Polynomial Logistic Regression Results

Appendix 7

Table A7.1 PLR for MCCONT*DMCARE: Results by Equation
Reference Category is Cell 1: MCC Y DMC Y
Pseudo-Rsquare: 0.140

	Cell 2: MCC Y DMC N				Cell 3: MCC N DMC Y				Cell 4: MCC N DMC N			
	Coeff.	s.e.	P>|z|	OR	Coeff.	s.e.	P>|z|	OR	Coeff.	s.e.	P>|z|	OR
mcdpri	0.406	0.598	0.497	1.500	-0.164	0.427	0.702	0.849	-0.825	0.791	0.297	0.438
mcrpri	1.047	2.372	0.659	2.850	-0.768	1.708	0.653	0.464	-1.840	3.139	0.558	0.159
feeindx3	0.091	0.118	0.439	1.096	-0.113	0.126	0.369	0.893	-0.409	0.286	0.152	0.664
zsex	1.207	0.177	0.000	3.343	0.186	0.161	0.248	1.204	0.886	0.231	0.000	2.426
meyrcat1	0.166	0.075	0.027	1.181	0.270	0.050	0.000	1.310	0.303	0.091	0.001	1.354
sp4med	3.490	0.612	0.000	32.796	0.258	0.165	0.119	1.294	1.085	0.316	0.001	2.959
sp4sur	1.709	0.633	0.007	5.525	0.021	0.165	0.901	1.021	-0.577	0.420	0.170	0.562
sp4oth	2.555	0.640	0.000	12.868	0.776	0.186	0.000	2.173	1.334	0.331	0.000	3.796
cert	0.271	0.213	0.203	1.312	-0.765	0.121	0.000	0.465	-1.148	0.205	0.000	0.317
n2to5	0.347	0.195	0.075	1.415	-0.272	0.142	0.054	0.761	-0.616	0.340	0.071	0.540
n6plus	0.571	0.272	0.036	1.770	-0.805	0.259	0.002	0.447	-0.538	0.526	0.307	0.584
ninst	0.400	0.213	0.061	1.491	0.255	0.148	0.086	1.290	0.814	0.239	0.001	2.258
patunew3	1.850	0.668	0.006	6.359	2.719	0.448	0.000	15.170	4.199	0.539	0.000	66.615
multi	-0.605	0.285	0.034	0.546	0.296	0.239	0.216	1.344	0.414	0.500	0.408	1.513
urban	-0.171	0.323	0.596	0.843	-0.759	0.179	0.000	0.468	-0.218	0.405	0.590	0.804
hmopop	0.184	0.256	0.473	1.202	-0.641	0.203	0.002	0.527	-0.459	0.334	0.169	0.632
arf65	-1.702	2.391	0.477	0.182	0.183	1.570	0.907	1.201	-9.603	3.526	0.006	0.000
arfpci92	0.022	0.152	0.887	1.022	0.096	0.113	0.398	1.100	0.092	0.188	0.625	1.096
docpop	-0.239	0.399	0.549	0.787	0.319	0.165	0.053	1.376	0.374	0.367	0.308	1.453
H-L Goodness of Fit (a):				0.079				0.696				0.956
Psuedo-R-Square (a):				0.206				0.165				0.312

(a) Calculated for the binomial logistic regression of cells 2, 3, and 4 against the reference.

Appendix 7

Table A7.2 PLR for MCCONT*DMCAID: Results by Equation
Reference Category is Cell 1: MCC Y DMD Y
Pseudo-Rsquare: 0.135

	Cell 2: MCC Y DMD N				Cell 3: MCC N DMD Y				Cell 4: MCC N DMD N			
	Coeff.	s.e.	P>|z|	OR	Coeff.	s.e.	P>|z|	OR	Coeff.	s.e.	P>|z|	OR
mcdpri	0.048	0.527	0.928	1.049	-0.517	0.433	0.233	0.596	0.463	0.775	0.550	1.589
mcrpri	-0.478	2.138	0.823	0.620	-1.547	1.716	0.367	0.213	0.531	3.248	0.870	1.701
feeindx3	0.381	0.099	0.000	1.463	-0.131	0.133	0.322	0.877	-0.018	0.238	0.940	0.982
zsex	0.002	0.197	0.992	1.002	0.202	0.152	0.185	1.224	0.033	0.270	0.903	1.033
meyrcat1	0.222	0.061	0.000	1.248	0.251	0.052	0.000	1.285	0.440	0.087	0.000	1.553
sp4med	-0.399	0.210	0.057	0.671	0.266	0.166	0.108	1.305	-0.425	0.328	0.195	0.654
sp4sur	-0.428	0.212	0.044	0.652	0.003	0.170	0.988	1.003	-0.667	0.351	0.057	0.513
sp4oth	0.245	0.238	0.302	1.278	0.520	0.198	0.009	1.682	1.430	0.305	0.000	4.181
cert	-0.042	0.171	0.806	0.959	-0.845	0.122	0.000	0.430	-0.999	0.207	0.000	0.368
n2to5	-0.287	0.156	0.066	0.750	-0.282	0.146	0.054	0.755	-0.852	0.302	0.005	0.427
n6plus	-0.738	0.252	0.003	0.478	-0.884	0.265	0.001	0.413	-1.021	0.493	0.038	0.360
ninst	-1.252	0.241	0.000	0.286	0.353	0.146	0.016	1.423	-0.482	0.266	0.070	0.618
patunew3	-3.531	1.393	0.011	0.029	4.569	0.984	0.000	96.458	-2.394	1.616	0.139	0.091
patunsq	5.962	1.842	0.001	388.503	-2.371	1.423	0.096	0.093	6.914	1.893	0.000	1006.637
multi	0.514	0.245	0.036	1.672	0.413	0.243	0.088	1.512	0.572	0.487	0.239	1.772
urban	1.064	0.439	0.015	2.898	-0.696	0.179	0.000	0.499	0.366	0.472	0.438	1.443
hmopop	-0.030	0.224	0.894	0.971	-0.706	0.209	0.001	0.494	-0.400	0.327	0.221	0.670
arf65	-3.176	2.128	0.136	0.042	-1.042	1.614	0.519	0.353	-3.107	3.236	0.337	0.045
arfpci92	0.809	0.127	0.000	2.245	0.103	0.123	0.404	1.108	0.666	0.177	0.000	1.946
docpop	-0.705	0.451	0.118	0.494	0.340	0.164	0.038	1.405	0.067	0.448	0.881	1.069
H-L Goodness of Fit (a):				0.609				0.758				0.236
Psuedo-R-Square (a):				0.154				0.182				0.33

(a) Calculated for the binomial logistic regression of cells 2, 3, and 4 against the reference.

Table A7.3 PLR for Physician Participation Patterns (COMBO): Results by Equation
Reference Category is Cell 1: MCC Y DMC Y DMD Y
Psuedo-Rsquare: 0.10

	Group 2: Selective Players				Group 3: Only FFS			
	Coeff.	s.e.	P>|z|	OR	Coeff.	s.e.	P>|z|	OR
mcdpri	0.493	0.432	0.253	1.638	-0.204	0.419	0.627	0.816
mcrpri	0.421	1.716	0.806	1.524	-1.284	1.663	0.440	0.277
feeindx3	0.308	0.094	0.001	1.361	-0.048	0.129	0.707	0.953
zsex	0.619	0.146	0.000	1.857	0.374	0.149	0.012	1.453
meyrcat1	0.241	0.052	0.000	1.273	0.303	0.049	0.000	1.354
sp4med	0.912	0.188	0.000	2.488	0.385	0.160	0.016	1.469
sp4sur	0.081	0.198	0.684	1.084	-0.030	0.163	0.852	0.970
sp4oth	0.655	0.222	0.003	1.924	0.745	0.186	0.000	2.107
cert	0.215	0.148	0.146	1.240	-0.811	0.118	0.000	0.444
n2to5	-0.114	0.133	0.389	0.892	-0.304	0.138	0.028	0.738
n6plus	-0.276	0.201	0.169	0.759	-0.870	0.247	0.000	0.419
ninst	-0.373	0.163	0.023	0.689	0.228	0.144	0.113	1.256
patunew3	0.805	0.580	0.165	2.236	3.039	0.448	0.000	20.884
multi	0.122	0.203	0.547	1.130	0.355	0.230	0.122	1.427
urban	0.350	0.261	0.179	1.419	-0.677	0.176	0.000	0.508
hmopop	0.007	0.184	0.968	1.008	-0.743	0.199	0.000	0.476
arf65	-2.597	1.698	0.126	0.075	-0.940	1.552	0.544	0.391
arfpci92	0.538	0.107	0.000	1.712	0.249	0.113	0.028	1.283
docpop	-0.489	0.309	0.114	0.613	0.307	0.163	0.060	1.360
H-L Goodness of Fit (a):				0.564				0.833
Psuedo-R-Square (a):				0.122				0.194

(a) Calculated for the binomial logistic regression of cells 2, 3, and 4 against the reference.

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Curriculum Vita

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DATE AND PLACE OF BIRTH:

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EDUCATION:

A.B.D., Johns Hopkins School of Hygiene and Public Health, Department of Health Policy and Management.
Thesis Topic: Patterns of Physician Participation in a Changing Health Care Market: Implications for Medicare and Medicaid.
Faculty Adviser: Gerard F. Anderson, Ph.D.
Honors: HCFA Dissertation Grant, Qualifying Exam passed with distinction, departmental scholarship, Marilyn Bergner Award

Master of Public Affairs, Woodrow Wilson School of Public and International Affairs, Princeton University, June 1992 (Also obtained Certificate in Demography from the Office of Population Research).
Honors: Somers Prize, Woodrow Wilson Fellow

Bachelor of Arts, University of Wisconsin - Madison, International Relations and French, December 1988. Honors: Phi Beta Kappa, Phi Kappa Phi, Dean's List

Diplôme semestriel de l'histoire et la litérature française, Université de Paris, la Sorbonne, Paris, France, May 1988.

PROFESSIONAL EXPERIENCE:

June 1997-March 1998 ***Research Associate***, Center for Hospital Finance and Management, School of Hygiene and Public Health, Johns Hopkins University. Conducted research and drafted papers on the impact of managed care on the hospital sector.

Oct. 1996-Jan. 1997 ***Teaching Assistant,*** Organization, Finance and Delivery of Health Services, Department of Health Policy and Management, School of Hygiene and Public Health, Johns Hopkins University. Assisted in developing reading list and writing exam questions, graded exams, and served as a resource for students in this introductory course on health systems.

Oct. 1994-present ***Consultant***, Human Resources Development Division, Country Department III, Europe and Central Asia Regional Vice-Presidency (EC3HR), World Bank. Responsible for designing the maternal and child health components of the proposed $70 million Russia Health Reform Pilot Project, including identification of activities and appraisal of project content. Participated in a review of maternal and child health care norms in Russia and field research on changing clinical practice in one maternity home and two women's consultations.

July 1992- *August 1996*	***Consultant***, Human Development Department, Human Capital Development and Operations Policy Vice-Presidency (HDD), World Bank. As part of the team focused on population issues, responsible for writing, editing, and producing a quarterly newsletter for World Bank staff; administering a Special Grant Program; monitoring World Bank lending in population; and contributing to a review of World Bank experiences in population. Operational support activities included conducting a demographic analysis incorporated into a poverty assessment for Jordan, and participating in the identification, preappraisal, and appraisal of maternal and child health components of a health project in Ukraine.
June 1991- *July 1991*	***Family Planning Intern***, CARE/Haiti. Assisted with development of monitoring and documentation systems for a family planning pilot project connected with a grass roots maternal and child health education project. Major issues examined were community-based distribution of supplies, sustainability, and appropriate educational approaches.
Jan. 1991- *June 1991*	***Research Assistant***, Population Resource Center, Princeton, NJ. Researched, designed and wrote four executive summaries to be used in briefings of legislators, interest groups, and other policy makers. Topics included Contraceptive Use in the United States, Contraceptive Methods, A Demographic Profile of Nigeria, and A Demographic Profile of Indonesia.
May 1989- *May 1990*	***Executive Assistant***, Management Systems International, Washington, D.C. Assisted in the management and implementation of projects for fast-growing development management consulting firm. Major clients included the U.S. Agency for International Development, the United Nations Development Programme, and host-country governments. Wrote proposals, budgets, and final reports for projects; conducted research; and created and maintained consultant database.

PUBLICATIONS:

Worzala, Chantal: "Conservation Through Contraception: The Environmental Lobby for International Population Assistance," *Journal of Public and International Affairs*, Number 2, June 1992.

Worzala, Chantal: "The Demographic Dimensions of Poverty in Jordan," *World Bank Regional Working Paper, Middle East and North Africa Region*, Number 12, August 1994.

World Bank: *Population and Development: Implications for the World Bank*, Washington, D.C., 1994. Contributor.

Patricia Stephenson, France Donnay, Olga Frolova, Tatiana Melnick, Chantal Worzala: “Changing Norms: Quality Improvements in Russian Women’s Health Care,” World Bank Regional Working Paper, Europe and Central Asia Region. 1998.

Gerard Anderson, Chantal Worzala, Nannan Zhang. “Methods for Grouping MSAs by Their Level of Managed Care Market Development.” Johns Hopkins Center for Hospital Finance and Management Working Paper. 1997.

Gerard Anderson, Chantal Worzala, Nannan Zhang. “The Impact of Managed Care on Hospital Capacity, 1982-1996.” Johns Hopkins Center for Hospital Finance and Management Working Paper. 1998.

Chantal Worzala, Nannan Zhang, Gerard Anderson. “The Impact of Managed Care on Hospital Behavior,” Poster Session, Association for Health Services Research Annual Conference, Washington, D.C., 1998.

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